APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

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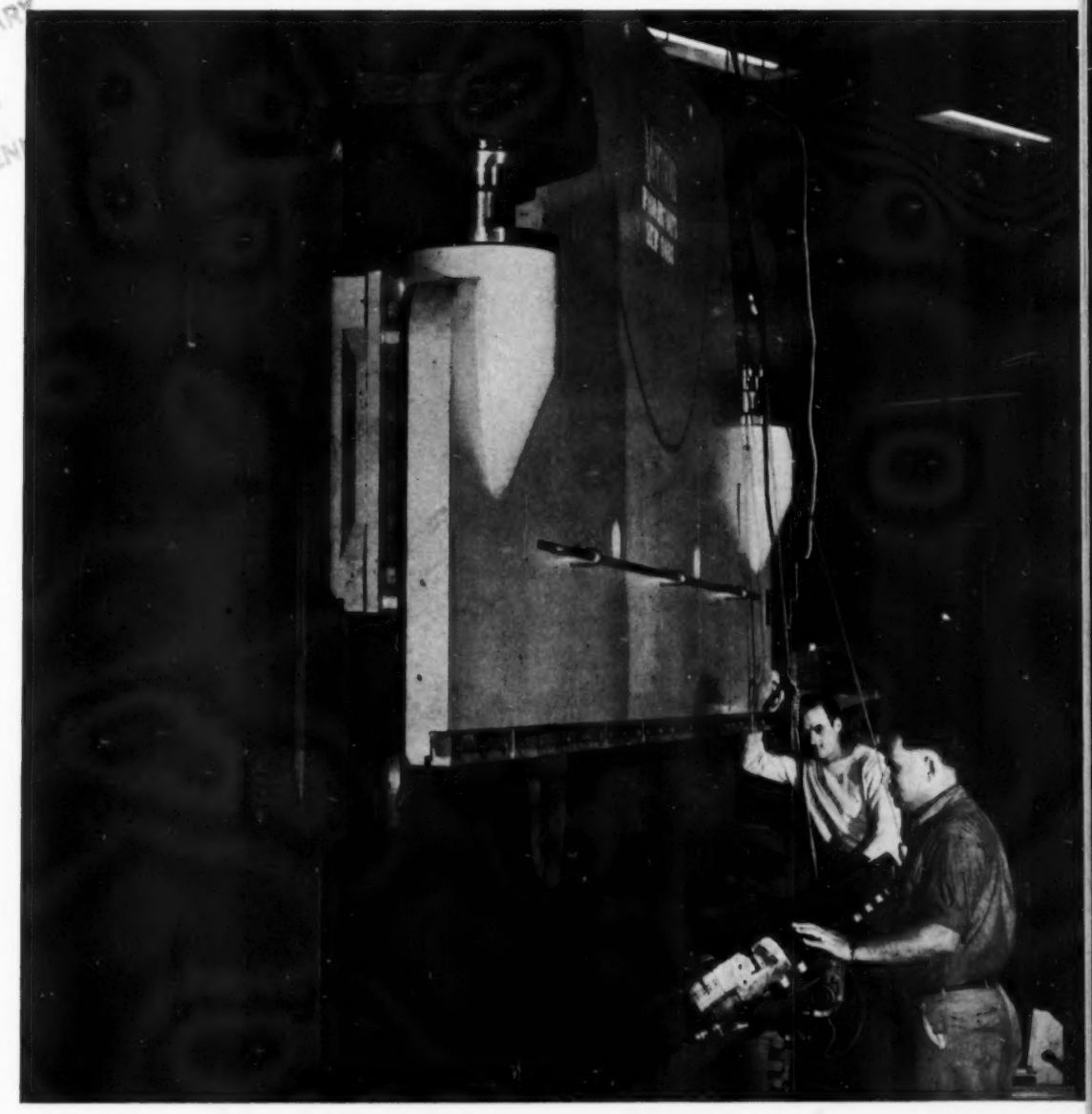

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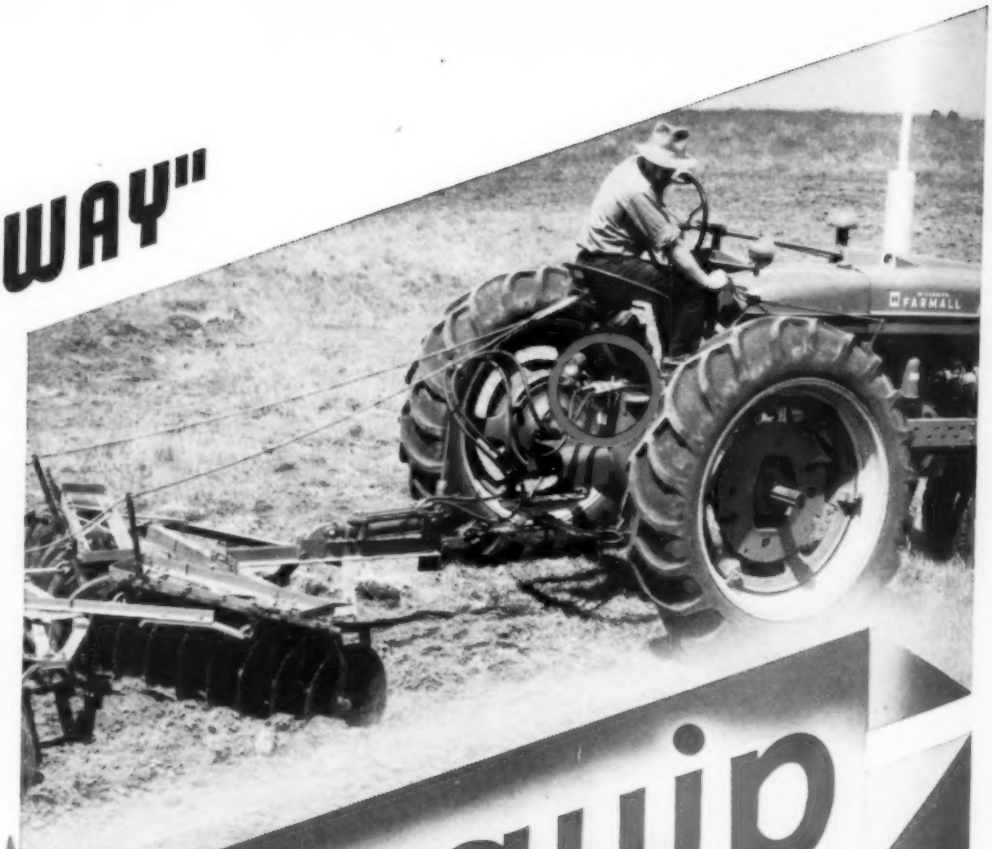
- COAL MINING WITH OIL—DESIGN OF THE COLMOL CIRCUIT
- OIL FILTERS — WHAT THEY ARE . . . HOW AND WHY ARE THEY USED

"BREAKAWAY"



For efficient operation of hydraulically-controlled implements, the Aeroquip "Breakaway" Coupling is the ABC rule. This rugged, field-proven unit provides two important services: it eliminates the breaking of hose lines and loss of hydraulic fluid whenever the implement breaks away from the tractor; it permits quick, easy connection and disconnection of implements and tractor. (Photo courtesy of International Harvester Company.)

Aeroquip

The "Breakaway", consisting of twin Self-Sealing Couplings mounted on a frame, connects both hydraulic pressure and return lines between tractor and pull-behind implements. The "Breakaway" can be separated by a tug on either hose line or by tripping the trigger manually. When uncoupled, both halves seal automatically keeping hydraulic fluid in and preventing dirt and air from entering the hydraulic system. The "Breakaway" can be reconnected easily even when under pressure. Operation is simple and foolproof.

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—with ANCHOR Ductile Sleeve Hose Couplings

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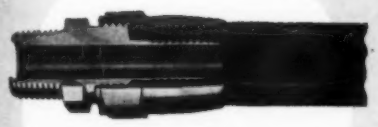

2-Piece Re-usable Couplings

Factory application of Anchor's exclusive Ductile Sleeve Coupling is your best insurance against leaks or blow-offs. Our superior grip gives you a plus margin of safety and a minimum time loss due to lay-up of equipment.

Here's how it works (referring to the illustration): Cover stock (G) is removed from the hose by grinding and buffing. Ductile Sleeve (C) is slipped on the end of the hose over the bare wire. Coupling body (A) with steel insert (B) attached is placed in position on the hose. The coupling is then swaged radially on the hose, imbedding the ductile sleeve into the internal grooves of the coupling shell (E) and into the mesh of the wire braid reinforcement (F). This is the exclusive Anchor patented grip.

Some of the applications of Anchor high-pressure flexible oil lines include high-pressure riveting, road machinery, snow plows, coal mining machinery, material handling machinery, machine tool applications, agriculture, railroads, oil field machinery, liquefied petroleum gas, lubrication and various other installations.

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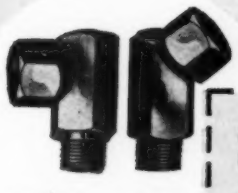

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D-1

APPLIED HYDRAULICS
The Magazine of Fluid Power Transmission

FRONT COVER: **Air powered jaw attachments on this hydraulic press brake converts it to a highly efficient, stretch press. The die and jaws are mounted on steel plates, free-hinged to the die plate.**

Photo by Western Round-Up

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Published monthly by THE HYDRAULICS PUBLISHING CO., an affiliate of INDUSTRIAL PUBLISHING Co., publishers of COMMERCIAL REFRIGERATION AND AIR CONDITIONING, DIE CASTINGS, FLOW, INDUSTRY & WELDING, OCCUPATIONAL HAZARDS, and THE TAXICAB INDUSTRY. Member, Controlled Circulation Audit, Inc., and National Business Papers Association.

Subscription rates: United States and possessions—$3.00 per year, $5.00 for 2 years; Canada—$4.00 per year, $6.00 for 2 years; Foreign—$5.00 per year. Single copy price, 30 cents. All subscriptions subject to individual acceptance by the publisher.

LETTERS to the Editor

I saw recently a new report that alumina cartridge filters have been developed for use in filtering industrial oils. Can you tell me who makes such equipment?

B.F.

As far as we can ascertain none of the leading manufacturers of filtering equipment for hydraulic or turbine oils offer such a filter. However, the Aluminum Company of America advises that activated alumina treaters have been in operation for some years on power oil systems and that extensive experimentation is under way to determine which grade of activated alumina is best suited to heavy industrial use and to automotive lubricants.

We would like to know who manufacturers low pressure (10 psi) hydraulic turbines.

J. C. K.

Several possible sources have been suggested to you by letter.

Where may we obtain copies of the papers delivered at the National Conference on Industrial Hydraulics? We understand that the Conference publishes the complete group of papers but that this takes several months.

K. P.

We understand that individual copies of papers delivered at the National Conference on Industrial Hydraulics are not available except that authors may, under conditions set down by the Conference, make such copies available for study or for publication. The Conference publishes the entire set of papers each year in Proceedings of the National Conference on Industrial Hydraulics. Copies of Vol. 1 (1947), Vol. 2 (1948) and Vol. 3 (1949) are still available from Armour Research Foundation of Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

We acknowledge receipt of several letters regarding the article "Emulsions as Hydraulic Fluids", published in the August issue of APPLIED HYDRAULICS. These have been referred to the authors for comment. Excerpts of both questions and answers will be published in an early issue.

(Concluded on page 12)

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TUBE FITTING

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- has *actually* passed rigid AN-F-47 performance test as required by J. I. C. standards. *Certified laboratory test report* available.

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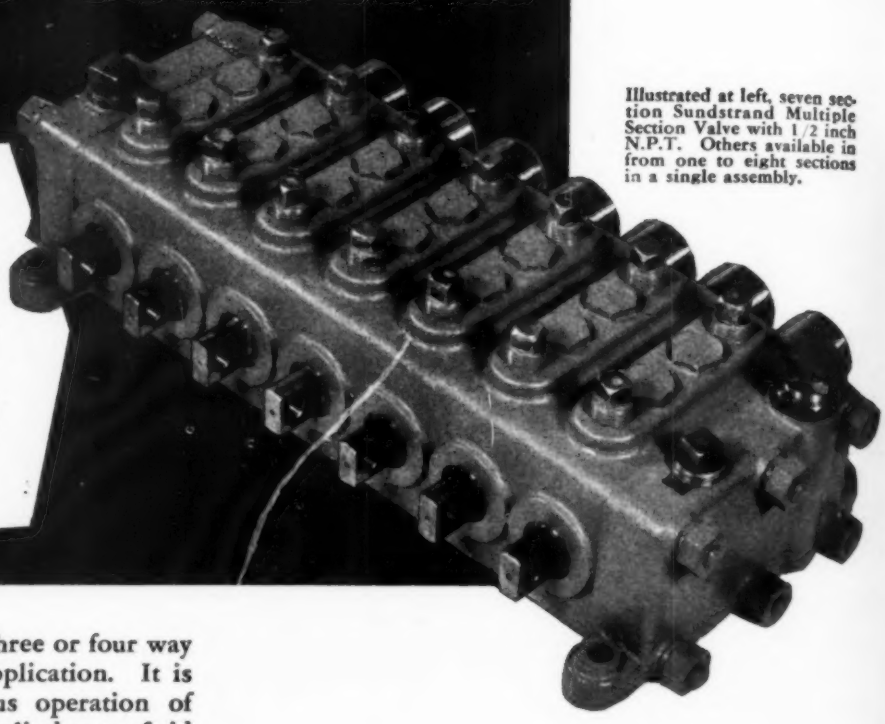

Illustrated at left, seven section Sundstrand Multiple Section Valve with 1/2 inch N.P.T. Others available in from one to eight sections in a single assembly.

Illustrated is a new Sundstrand three or four way Multiple Section Valve for series application. It is manually controlled for simultaneous operation of more than one actuated member (cylinder or fluid motor) from a single oil power source or pump, provided the total accumulated load on all actuated members does not exceed the relief valve setting.

These valves are made up of individual sections for control of each actuated member and may be furnished in up to eight controls in a single assembly. Sundstrand Multiple Section Valves are compact and can be conveniently placed for control of moving members from one station. They are made up of heavy close grained cast iron body sections and have ample mounting lugs. The stem for each section is sealed against oil leakage as well as infiltration of dirt or foreign material that might impair operation.

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(Continued from page 7)

We are at the point in building up our hydraulic service department that we are about ready for a test bench. Inquiries to manufacturers indicate that deliveries would be months away. Who can give us help in building a test set-up for our own special requirements?

G.W

The range of equipment in a test bench depends on the size and type of pumps and valves you must test. Standard test benches are built for a wide range of general testing. If you find conditions such that you wish to design and build your own bench equipment, you will find manufacturers of pumps, valve and gauges helpful. Call in representatives of your regular suppliers.

An additional answer to the question regarding early applications of hydraulics to machine tools, below, supplements the answers digested in this column in the October issue.

J. P. Crosby, vice president and sales manager of the Lapointe Machine Tool Co., Hudson, Mass., writes that the first hydraulic broaching machine was delivered to the Buick Motor Car Company on July 26, 1923. The company was then known as the J. N. Lapointe Company and was located at New London, Conn.

The original machine (4W) was a horizontal machine for internal work with an 8 in cast iron cylinder mounted on the rear end of the machine bed. A variable delivery, multi-plunger hydraulic pump provided for a maximum recommended pressure of 1000 psi. Draw rod stroke was 64 in and the speed was controllable from 0 to 24 fpm on the working stroke with a constant return speed of 60 pfm. A spring and plunger type stop automatically controlled the length of work stroke.

A second somewhat smaller broaching machine was also pioneered by this company. This machine, No. 3H, had a cylinder of 5 7/8 in, a stroke of 56 in and the same rates of cutting and return speeds and the same control of stroke length.

Some of the earliest users of these machines includes Dura Mfg. Company, Toledo, Ohio, July, 1924; C. B. Cottrell, Westerly, R. I., March, 1925; Spicer Mfg. Co., Pottstown, Pa., April, 1925; Cadillac Motors, Detroit, Mich., May, 1925 and International Harvester, Chicago, Ill., April, 1926.

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THE FIRST ANNUAL DIRECTORY NUMBER

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THE MAGAZINE OF FLUID POWER TRANSMISSION

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FIRST ANNUAL DIRECTORY NUMBER

Dear Reader:

From the very first issue of APPLIED HYDRAULICS Magazine, each month we have received hundreds of requests from our readers for information on where certain hydraulic and air circuit equipment can be purchased and what companies make this type of equipment. There is now no one place where such information can be obtained.

To provide a central reference, APPLIED HYDRAULICS Magazine, as a service to its readers, will issue each year an Equipment Directory Issue. The first annual Directory Issue will be our January 1951 number – it will include:

(1) A complete product listing
(2) A manufacturers listing
(3) A listing of components and services

We know that this Directory Issue will prove invaluable to you in procuring hydraulic and air circuit equipment and components. Be sure to watch for this First Annual Directory Number.

THE EDITORS.

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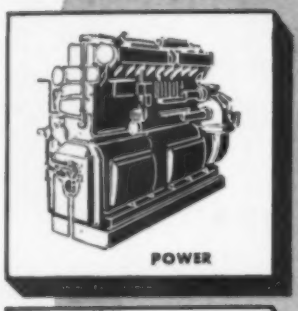

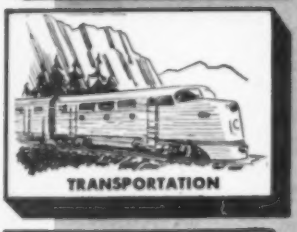

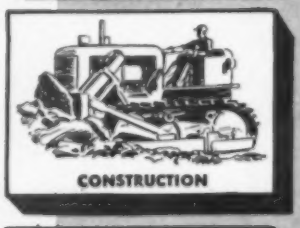

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Circle 37 on Reader Service Card

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FULFLO SPECIALTIES CO., INC. Included in the new Fulflo Mechanical Data Book are complete descriptions of their oil-relief and by-pass valves.

Circle 24 on Reader Service Card

HANSEN MANUFACTURING COMPANY. Data on their standard line of quick connector couplings and information on couplings to meet your specific requirements is available.

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HONAN - CRANE CORPORATION. Full information can be obtained on purification and maintenance of hydraulic oils.

Circle 43 on Reader Service Card

C. B. HUNT & SON, INC. Full details can be had describing Quick-As-Wink foot operated air valves for pressures to 125 psi.

Circle 46 on Reader Service Card

LEDEEN MFG. CO. Bulletin 500 presents cylinders for air, oil and water operation available to perform medium duty, heavy duty and super duty service.

Circle 45 on Reader Service Card

MINNESOTA RUBBER & GASKET CO. "'O' Ring Hydraulic Packings" a well illustrated catalog presents this company's line of injection molded seals.

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W. H. NICHOLSON & CO. The complete line of valves for air and oil operation is displayed in catalog 546.

Circle 31 on Reader Service Card

ORTMAN-MILLER MACHINE CO. Details and specifications on the full line of cylinders in 1½ to 8 inch bores are offered.

Circle 35 on Reader Service Card

THE PARKER APPLIANCE COMPANY. Tube fittings catalog 203 describing the complete line of fittings including Parker Triple-Lok can be had.

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PLASTIC & RUBBER PRODUCTS CO. Catalog and engineering data on their line of "O" rings will be sent on request.

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GEO. D. ROPER CORPORATION. For applications requiring pump capacities of 1 to 300 gpm at pressures to 300 psi, Catalog 950 presents the Series F helical gear pumps.

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ROSS HEATER & MFG. CO., INC. Bulletin 2.2K1 describing and illustrating the design features of the Ross Type CP heat exchanger is being offered.

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A. SCHRADER'S SON. Bantam size air clamps with strokes of 1 to 2 in. and cylinder diameter of 1, 2¼ and 3 in. are described in a catalog data sheet.

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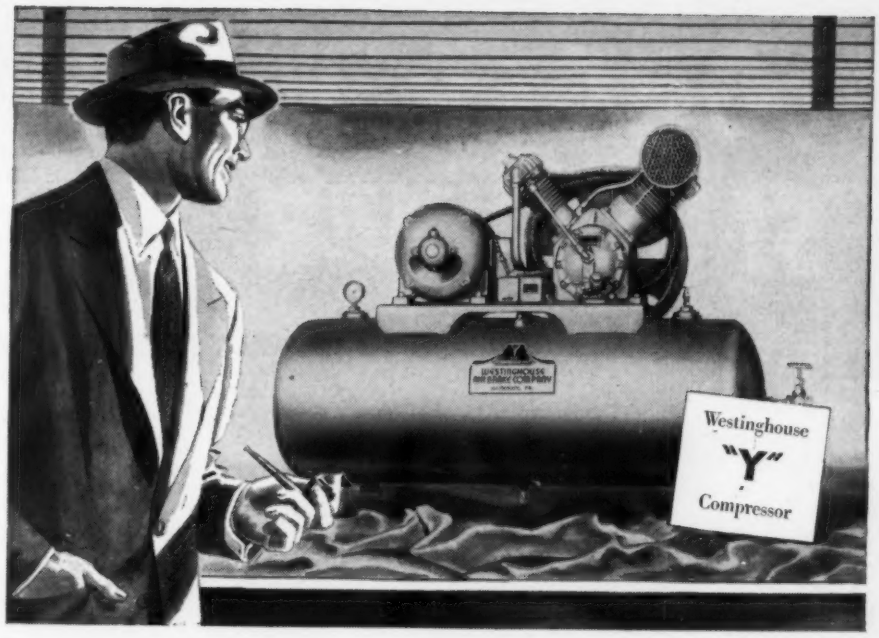

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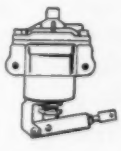

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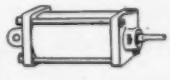

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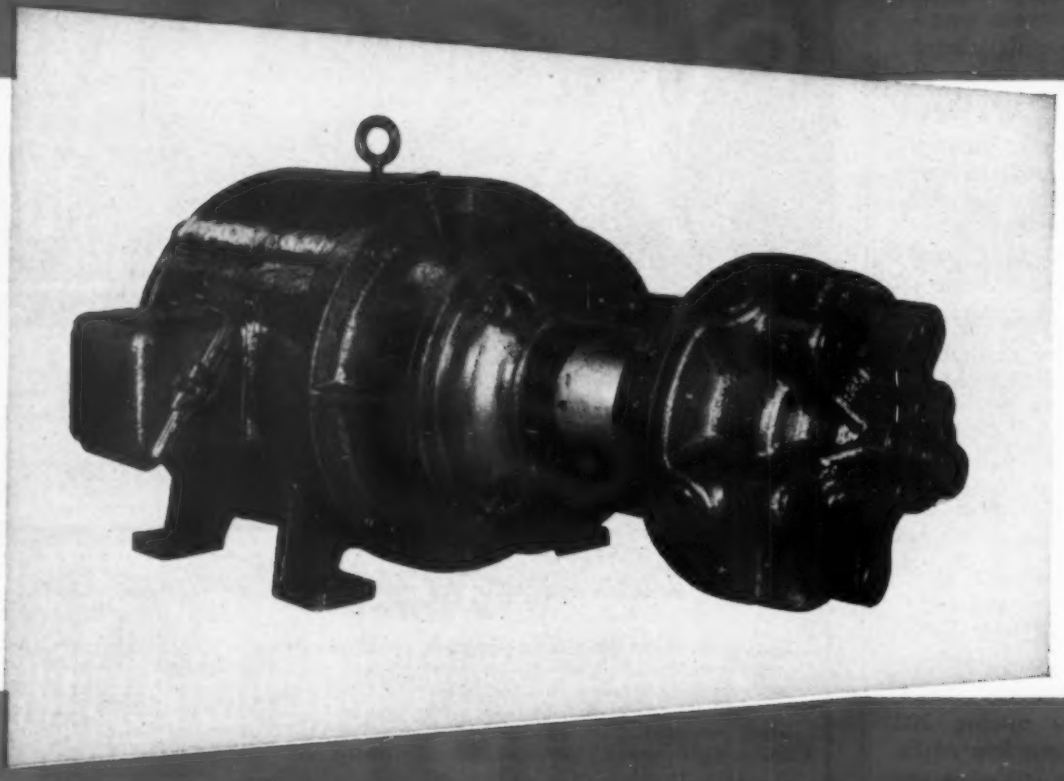

American Engineering Company constant displacement Hydramite Pump, for operation up to 5,000 p.s.i.

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Cecil C. Peck Co.

and

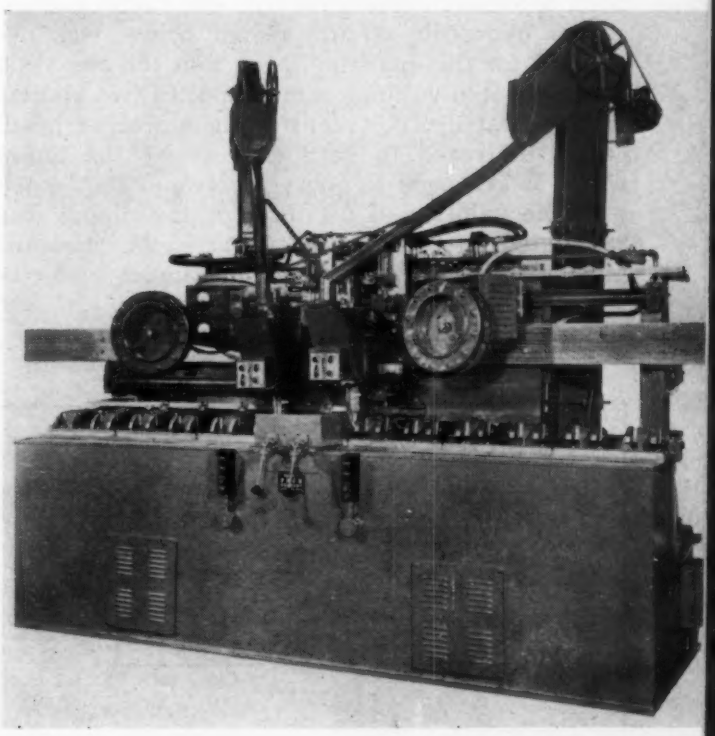
CHARLES H. HALLETT
S. G. Morris Co.

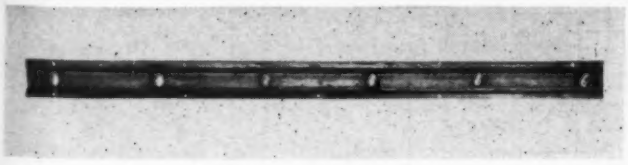
A HIGH LEVEL OF PRODUCTION WITH CONSIDERable reduction in welding costs has been attained with a special machine for welding combine rasp bars. The welder, using a hydraulic system to clamp the work pieces and to position the welder heads, has been designed and built by the Cecil C. Peck Company, Cleveland, for the agricultural field.

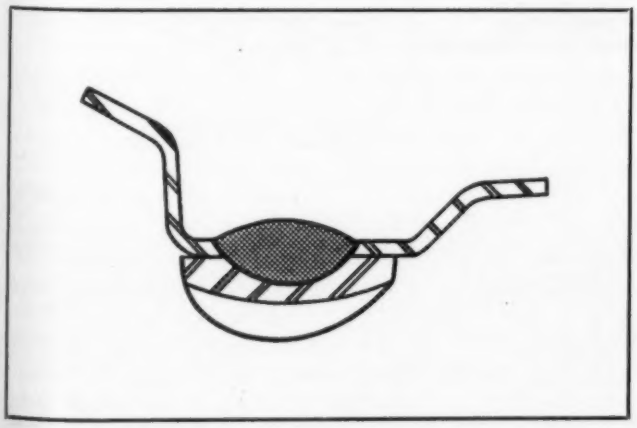
Automatic welding, as compared to the manual operation has increased production from nine bars per hour to twenty-seven, and reduced the rejects from ten percent to two percent. In the old method, the intermittent fillet weld resulted in a small weld area and, on high carbon steel, there was also a tendency to produce cracks. The resultant weld was also brittle and far weaker than the new rivet welding method.

The welding machine is a double unit, that is, each of the two welder heads welds a complete rasp bar. The operator loads one assembly under the six clamps on one side and while this assembly is being automatically welded, he is free to unload and load the other side.

Each welder head is positioned by a separate







The finished bar assembly is fastened with six equally spaced rivet welds, each weld is approximately 1⅛ in. diameter. This automatic process replaces an intermittent fillet weld which was manually laid on both sides of the rasp plate.

Each rasp bar assembly includes two pieces, a clamp bar and a rasp plate, which are fastened together by welding. The clamp bar is a formed part made from 10 ga. high carbon steel. The steel rasp plate is finished to ⅝ x 1¾ in. Each piece is 59 inches long.

66 in. stroke hydraulic cylinder and moves from its starting position out to the end of the table. During this traverse the head must stop, drop to the work, weld, pull up and travel on to the next weld. This is repeated six times to complete a bar. When the head reaches the end of the table, the cycle stops and a finished rasp bar is unloaded. A new set of pieces are loaded and the head moves back, again performing the six rivet welds. As work is being performed in both directions, there is no dead-head travel of the welding head.

To control the welder, a system had to be devised which would properly position the welder heads, rapidly move them between welds and smoothly accelerate and decelerate the heads at each of the six welding points. The welder heads must also move up and down at each welding point to avoid interference with the clamp fingers.

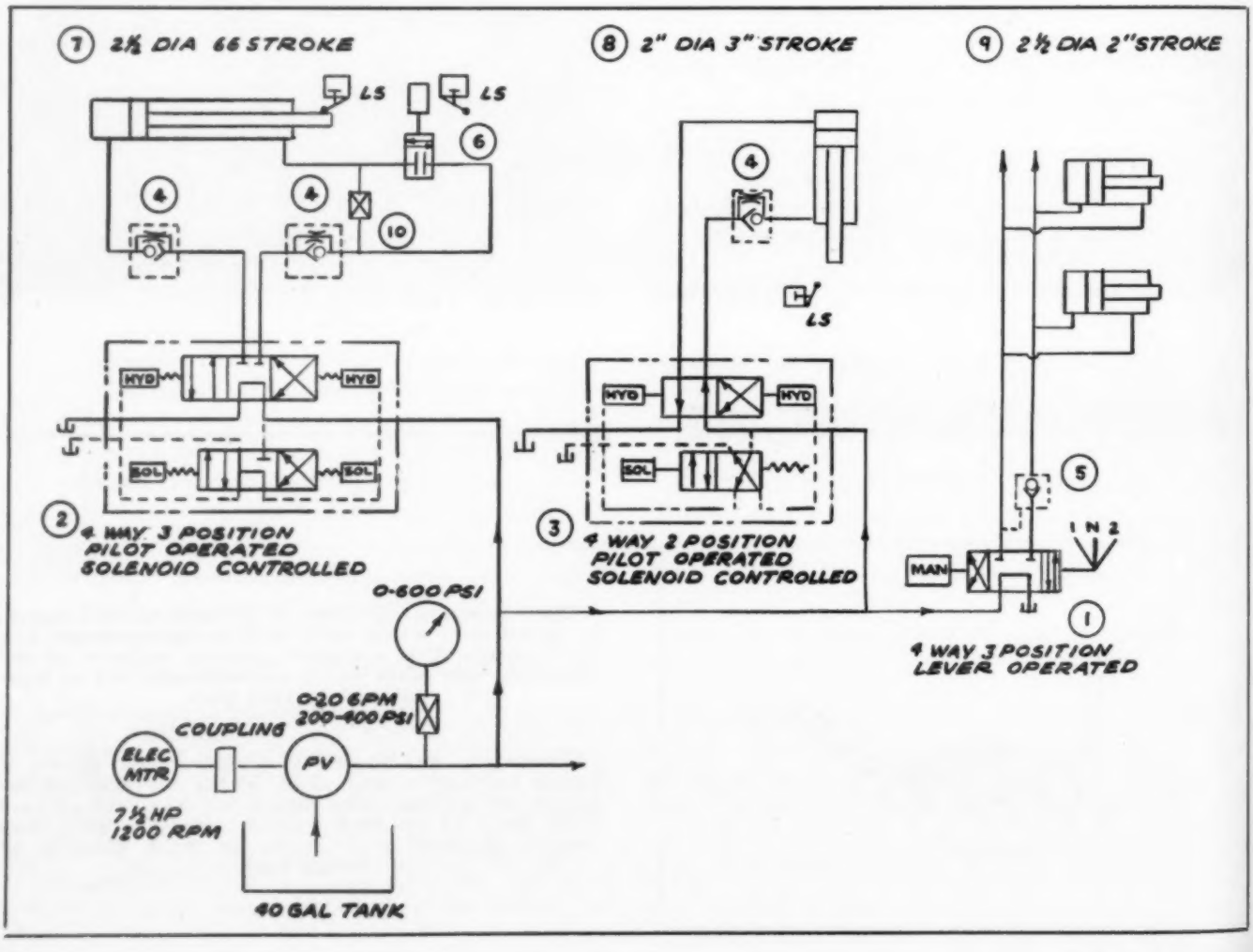
The hydraulic circuit shown below was developed for this machine. Note that the one vane type, variable volume pump supplies two similar circuits, each circuit controlling a welder head. Oil is delivered to both circuits by the pump which is arranged to operate between 200 to 400 psi. The velocity of oil through the piping was calculated on the basis of using ½ in. standard pipe which will hold the maximum velocity through the valves and piping to 10 fps or under. Steel tubing, ⅝ in. o.d. x .035 wall gives an ample safety factor.

FOLLOWING THE OPERATION OF THE RASP BAR WELDER

After the operator places a clamp bar and rasp bar under the clamps, he moves the lever of valve (1) to position 1 which will permit pressure oil to flow to the blank end of the six clamping cylinders (9), two of which are shown. The pilot check valve (5) blocks the oil in the blank ends of the clamping cylinders and prevents the pistons from backing away anytime the pressure in the supply manifold drops below the clamping pressure.

When the clamps are closed the operator depresses the forward start button. This button is electrically interlocked with the clamp cylinder and will not operate if the clamps are not in the closed position. This is an important safety feature and it also insures proper location of each of the parts.

The start button through a relay energizes solenoid "X" or "Y" of valve (2), depending in which direction the welding head is to travel, and the head begins to traverse along the horizontal



ways. Assume solenoid "X" is energized. This permits pressure oil to flow to the rod side of the traversing cylinder (7). At the instant this solenoid is energized, the straightway cam valve (6) is held in the closed position by a cam on a long cam bar which is actuated by the cylinder rod. Oil can flow in a controlled amount through the semi-needle valve (10) which will permit the piston of cylinder (7) to move to the "IN" position at an accelerated rate as cam valve (6) moves to the full open position.

When the piston of the cylinder (7) has moved approximately 10½ to 11 in. to the next welding position, the next cam on the cam bar will start to decelerate the movement by gradually closing off the cam straightway valve (6). When the roller of this valve is at the top of the cam, solenoids "X" and "Y" are both deenergized closing off all ports on valve (2) holding cylinder (7) in position. This application of the straightway cam valve and the needle valve provides smooth stopping and starting of the head at weld points and permits rapid travel between welding stations.

The movement of piston (7) trips a limit switch energizing a time delay control relay. When the head is properly positioned, the time delay relay energizes a second relay which closes the arc holding circuit and energizes 4-way valve (3) causing the welder head to lower into welding position. The rate of speed at which the piston of cylinder (8) moves is controlled by the speed control valve (4).

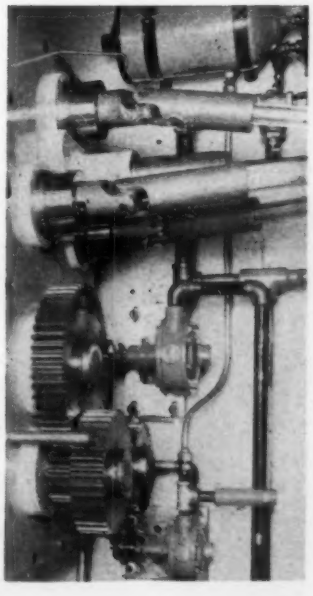
When the welding head is in the welding position another limit switch is also tripped by the piston which energizes a relay, closing the wire feed motor armature circuit and wire inch circuit permitting the welding wire to move into contact with the work.

As the wire contacts the work, the flux valve opens permitting flux to cover the arc. At the completion of the weld, which is accurately controlled by timers, the arc is broken, the flux gate valve closed and valve (2) is deenergized. This permits the welding head to return to the up position and travel on to the next welding station.

The operator then moves valve (1) to position 2 opening the clamps. The welded pieces can then be removed; the machine is loaded; the start reverse button is depressed and the cycle is repeated in the opposite direction.

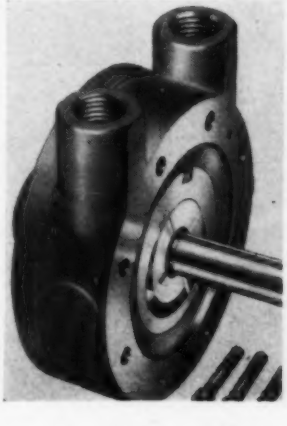
Lubrication and Cooling for Thread Roller

PROVIDING COOLANT TO THE WORK, AND LUBRICATING OIL TO THE MACHINE parts is a requirement which must be met by all the machine tool builders. With the use of small, efficient pumps, this need can be readily supplied with a simple, compact system.



Two vane type pumps are used in the installation on a Reed Cylindrical Die Thread Rolling Machine. One pump is used for lubrication and the second pump for furnishing coolant to the dies.

There is a 55 gallon coolant tank in the bottom of the machine from which both the lubrication, for the spindle bearings and oscillating head, and the coolant to the rolls is supplied. The same oil is used for lubrication and cooling.



While both the lubricating and coolant pumps draw oil through strainers from the same tank, the circuits are separate. The smaller lubrication pump moves oil from the tank through a filter to a junction box or manifold which distributes oil to the various centers. The lubrication pump is arranged with a relief valve on the discharge side to determine the pressure for the system.

The coolant pump draws oil from the tank to a manifold pipe which distributes oil on the dies and work.

Pneumatic Loading in the Textile Field

By WALTER H. RIDLEY

THE PRINCIPLE OF PNEUMATIC LOADING IS NOW being successfully employed in industrial processes of every kind in which it is important to control the nip, or roll pressure, in a stack or press-type machine. Because of the nature of their operations and their processing equipment, the paper industry and the textile industry are the two in which pneumatic loading finds the most numerous applications.

The development of continuous processing, in place of batch processing, in such operations as dyeing, scouring and bleaching, has created a great field for the use of pneumatic loading. In fact, the pneumatic loading of squeeze rolls for many textile mill operations is now so generally accepted that it is incorporated in the standard design of the equipment.

Three typical applications are shown. Figure 1 shows a pneumatic loading control system on a conventional dye padder in a New England cotton bleachery. Air cylinders permit individual control on each end of the roll. Quick, accurate control of the nip pressure (0 to 15 tons) in this operation, is essential for uniformity of pick-up of dyestuff; the elimination of waste in dye liquor is also important.

Figure 2 shows the cylinders and control panel for the pneumatic loading of the final squeeze rolls of a crabbing machine in a Massachusetts worsted mill. The advantages desired are the maximum extraction (15 tons pressure) with the least wear on the roll covering.

Figure 3 shows the equipment for pneumatic loading on the size box squeeze rolls of a cotton slasher in a North Carolina textile mill. In this starching operation the precise adjustment of the loading from 75 to 1500 pounds, accurate duplication of loads, and, of course, maximum pro-

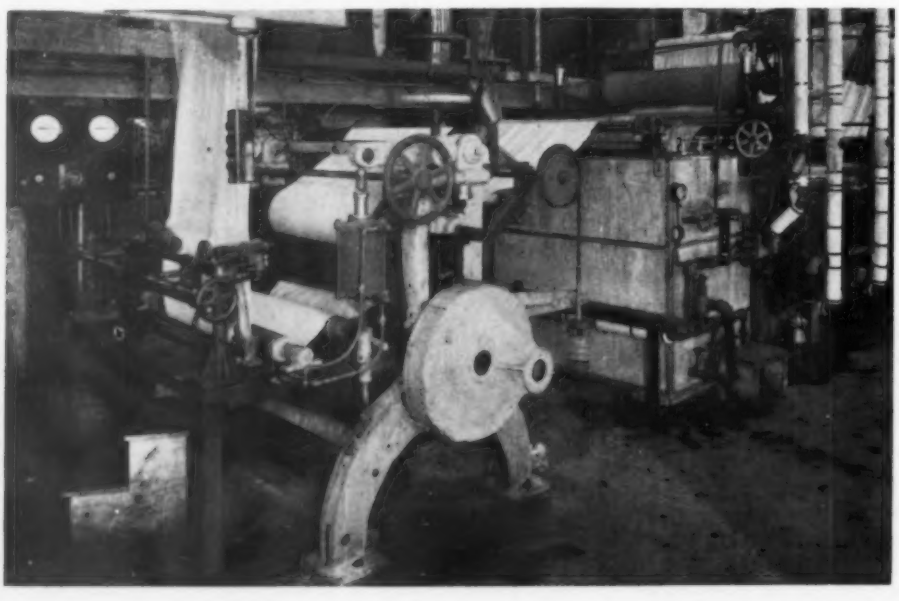


Fig. 1. A pneumatic loading system on a conventional dye padder in a New England cotton bleachery. Air cylinders permit individual control of pressure on each end of the roll.

Advantages of Pneumatic Loading

1. Insures uniform, top-quality product at
2. Higher speeds with
3. Simple, dependable equipment that is
4. Adaptable to new or old machines; all
5. Adjustments are easy, fast and precise.
6. Rolls are cushioned, giving
7. Accurate sizing and
8. Protection against "flat" rolls; method
9. Reduces maintenance and
10. Increases production.

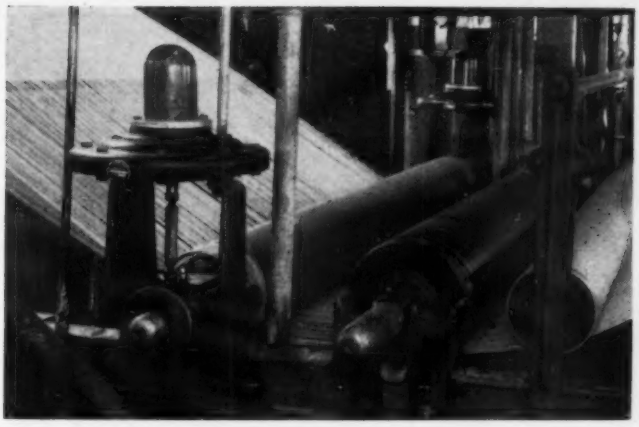


Fig. 3. A starching operation on the size box squeeze rolls of a cotton slasher in a North Carolina textile mill in which diaphragm motors are used instead of air cylinders. In this operation the precise adjustment of the loading, accurate duplication of loads and maximum processing speed are the major considerations.

cessing speed, are the chief considerations. Instead of air cylinders, this setup employs open yoke, self-aligning diaphragm motors.

"Open width" or "wide face" squeeze rolls for squeezing the excess moisture out of cloth before going to the dryer came into use at about the same time pneumatic loading was introduced. The commonly used, and practically only good method up to that time, was the centrifugal basket extractor. This equipment did an excellent job of extracting, but had two major defects, one was that it was extremely expensive to operate, since it was a batch-process method, instead of continuous. The other was that the moisture left in the cloth was unevenly distributed. Mills frequently used expensive vacuum extractors in combination with open width squeeze rolls, or in addition to the basket extractors, to obtain uniform moisture distribution before drying.

With pneumatic loading control systems, consistent uniformity of extraction could be obtained by open width squeeze rolls. The flexibility of a compressed air system provided easy, quick and precise adjustment, immediately gaining a number or very important benefits.

The mill was able to turn out a uniform, top-quality product at higher speed, which meant greater volume. Necessary machine adjustments to compensate for rolls out-of-round or other changes due to wear were accelerated. The simplicity of the method and its dependability contributed to the new and increased efficiency of the various padding operations.

There are other advantages, each important in its own way. For example, in dye padding and similar applications, a customer may want a definite pick-up in liquor from the padding ma-

(Concluded on page 42)

Fig. 2. The air cylinders and the control panel for the pneumatic loading of the final squeeze rolls on a crabbing machine.

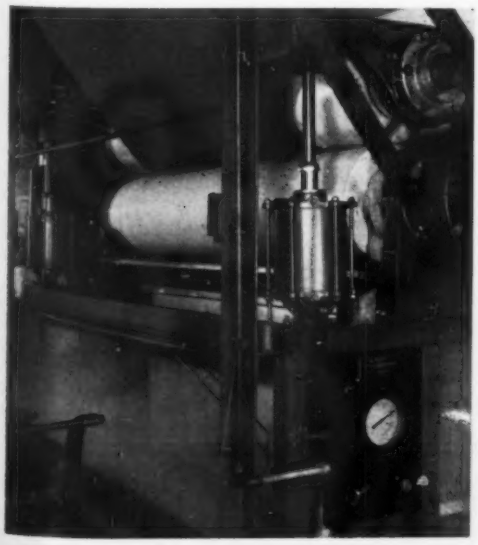
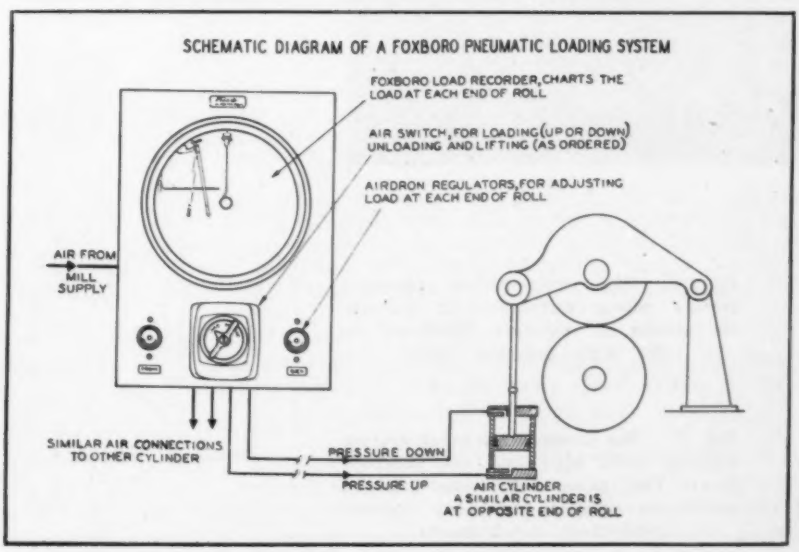


Fig. 4. A schematic diagram of a pneumatic loading control system applied to a typical dye padder. The instrument shown is a two-pen pressure recorder, used where accurate control is so important that chart records are essential.


SCHEMATIC DIAGRAM OF A FOXBORO PNEUMATIC LOADING SYSTEM
FOXBORO LOAD RECORDER, CHARTS THE LOAD AT EACH END OF ROLL
AIR SWITCH, FOR LOADING (UP OR DOWN) UNLOADING AND LIFTING (AS ORDERED)
AIRDRON REGULATORS, FOR ADJUSTING LOAD AT EACH END OF ROLL
AIR FROM MILL SUPPLY
SIMILAR AIR CONNECTIONS TO OTHER CYLINDER
PRESSURE DOWN
PRESSURE UP
AIR CYLINDER
A SIMILAR CYLINDER IS AT OPPOSITE END OF ROLL

This Central System Keeps Pace With Growing Production

By F. ELTVEDT
Operating Engineer
Chicago Die Mold Mfg. Co.

THE CENTRAL HYDRAULIC SYSTEM at the Chicago Die Mold Mfg. Co. is unusually flexible and supplies any production requirement for the 75 presses used for plastic molding. Like many industrial installations, this system was not built in a short time, but grew to keep pace with the demands of the production requirements of this company.

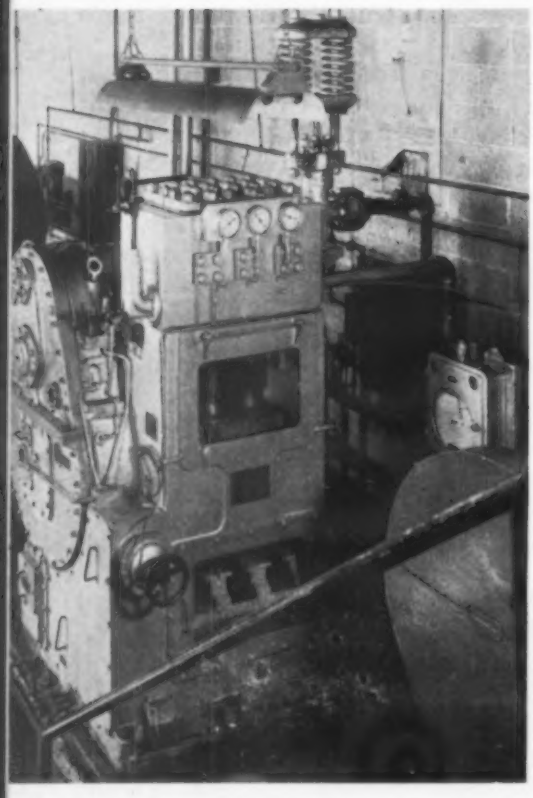


Fig. 1. The reciprocating plunger, triplex pump automatically adjusts the stroke ot maintain 3000 psi in the high pressure line.

The original equipment consisted of a 9-gallon, 3000 psi pump and a small pressure bottle accumulator. Because this setup lacked a low pressure prefill system, we added a 250 psi triplex pump. Both pumps were replaced by the initial unit of the present central system.

This initial unit was a 17-gallon, 3000 triplex pump; a 71-gallon, 600 psi pump was added a year later. Both pumps have 30 hp motors built on identical frames with interchangeable power-ends and unloading devices.

Two years later the low pressure system was completed with the addition of the 218 gpm, 600 psi pump driven by a 75 hp motor, and a large low pressure vessel accumulator which controls both pumps.

Both low pressure pumps and the 17-gallon high pressure pump are equipped with suction valve controls. When the pressure vessels are full and the pressure rises to a predetermined point, the suction valves are held open and prevent the pumps from discharging liquid. When the pressure drops to the required value, the suction valves will seat and the pumps will deliver their full capacity.

To complete the high pressure system, a 60 hp reciprocating plunger pump with automatic control of pump stroke for a capacity of 0 to 32 gpm at 3000 psi was installed. A specially designed surge tank, which is elevated above the pump to give adequate suction head and insures full pump delivery, was added.

With the four pumps, the combination can be selected which requires the least horsepower for the work in hand. A change from a low to a high production level can be made in two minutes. Safety shut off valves are not used, but the high and low pressure lines are stop-valved ahead of each press for isolation purposes.

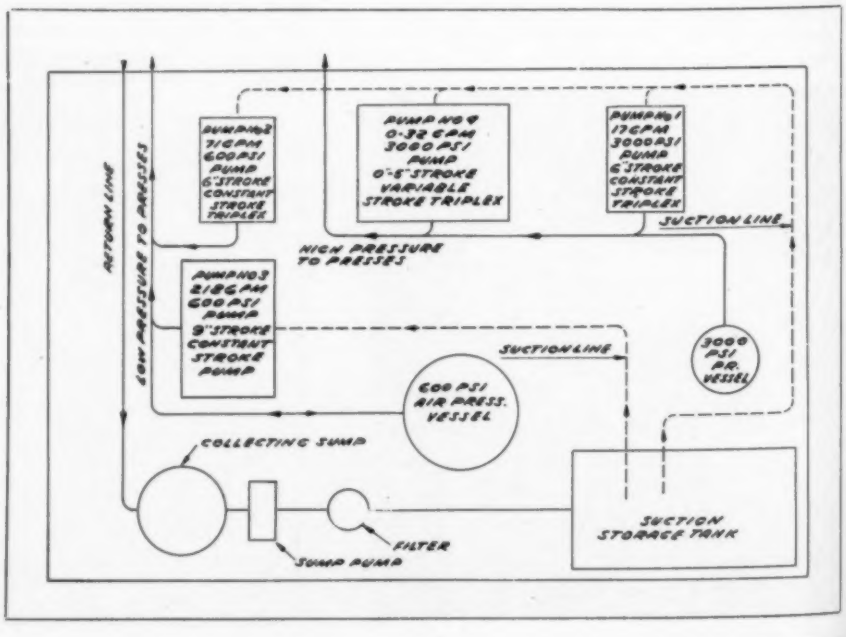


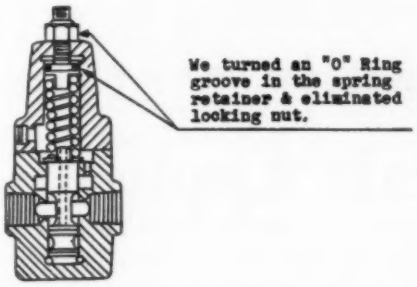
Fig. 2. The complete central system supplies both high and low pressure lines. The pump capacities can be added in parallel to meet varying production requirements.

HERE'S HOW

- PREVENTIVE MAINTENANCE
- SERVICE PROCEDURES
- MODERNIZATION
- SHORT CUTS

Stops Leakage With "O" Ring

We had an application for a relief valve where it was necessary to change relief settings every few minutes, so it was not desirable to place the cap over the



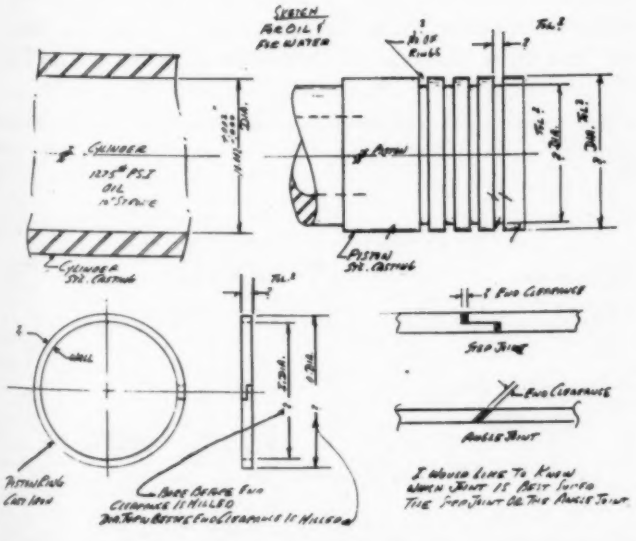
pressure adjusting screw each time the pressure was changed. By leaving the cap off, oil leaked around the threads on the adjusting screw, we applied a neoprene seal in the place shown on the sketch and the oil leakage stopped.

JAMES SEEVERS
Galion, Ohio

Here's a Piston Ring Problem

THE PISTON RING SELECTION PROBLEM SHOWN IN THE sketch was sent to us by Nicholas Rosmando. Answers to this specific problem were supplied by several manufacturers and forwarded to Mr. Rosmando.

How to select piston rings is a specialized problem for which many design men would like some rules. James N. Lowe, Ring Engineer for Burd Piston Ring Company, offers the following data to solve Mr. Rosmando's problem and to help in all ring selections.



Starting at the upper left of Mr. Rosmando's sketch, we anticipate that he will have difficulty in holding the bore tolerance of +.002/-.000 shown. While this is desirable, it will be difficult. A .004 or .005 tolerance is more in line with usual practice. A honed finish is generally most satisfactory for a piston ring seal. It should be in the range of 15 to 35 microinches RMS. The pressure shown is readily sealed by rings. Cylinder taper in the order of a thousandths has no apparent effect on the seal except as it affects ring end clearance. Slight out-of-roundness has no serious effect so long as the error is not confined to a small area on the cylinder wall which may result in "daylight" at the ring face.

Groove Width

Depending on the efficiency of the seal, piston length and anticipated life, two to four rings are suggested. They should be straight face rings of ¼, 5/16, or ⅜ width for this bore diameter and application.

Grooves should be machined with lands between them adequate to withstand the fluid load on them without bending measurably. The groove sides should be as smooth as they can be machined as a seal must be established between the ring and piston land as well as between the ring and cylinder wall. The grooves must be true and the sides perpendicular to the piston axis.

Clearance

Grooves must provide clearance between the ID of the ring and the groove bottom, but the amount of clearance is not critical. Therefore the groove bottom diameter could be 9.200 with some convenient tolerance as ±.005. Grooves should generally be .002 to .004 wider than their rings, but increased side clearance is only detrimental if the piston reverses direction in a rapid repetitive cycle. The rings must be free in the grooves and this requirement fixes the low limit for groove width. There is no advantage with plain rings in placing more than one in a groove.

The factors affecting radial pressure are the free opening or gap and radial thickness for any ring of a given diameter, width, and material. Thickness for hydrulic rings can be specified as a maximum and minimum, with the maximum computed according to the formula which follows: For rings over 8-inches diameter of piston ring type gray iron:

the maximum thickness = Bore Diameter/45+ .127. Under 8-inches diameter, the figures shown in the SAE Handbook are recommended. Tolerance on thickness over 8-inches bore diameter should be .015. For hydraulic rings, "tension" is relatively unimportant since the pressure against the cylinder wall is augmented by fluid pressure. Moderate pressure with good freedom from face light or "daylight" gives best results.

Ring widths for this diameter should be specified with the SAE maximum of .2490 for ¼, .3115 for 5/16, and .3740 for ⅜. A tolerance of .0015 is desirable in large bore sizes with .0010 tolerance under 8-inches bore and .0005 tolerance under 4½-inches bore.

Joint Style

As to style of joint, there is much misunderstanding. Unfortunately the Joint Industry Conference on Hy-

(Concluded on page 43)

Readers are invited to contribute their short cost and labor saving shop or plant ideas. Each contribution will be acknowledged and considered for publication. We will pay $5.00 for each item published.—Here's How Editor

FRED O. HOSTERMAN
Advisory Editor

The Closed Circuit Hydraulic System For Aircraft Applications

By CARL L. SADLER

IT HAS BEEN ACCEPTED PRACTICE FOR MANY YEARS to arrange the hydraulic pumps in the airplane hydraulic system to draw fluid directly from the reservoir and to return oil from the system to the reservoir. This type of system, generally termed an open circuit system, is shown schematically in Fig. 1.

As an alternate, consider the design of a hydraulic system as shown schematically by Fig. 2. Here, it is noted that the return fluid is directed to the inlet of the hydraulic pump and an auxiliary charge pump and charge relief valve are incorporated to maintain an adequate flow of oil and resultant pressure level in the main pump inlet. This arrangement of components covers the basic elements of a closed circuit system.

It is obvious that this latter system, with extra elements involved, introduces a higher degree of complexity than the conventional open circuit system and that its use as a generally accepted circuit for all aircraft hydraulic circuits would be unwarranted. However, there are instances where its use could be of appreciable advantage.

One such case could occur where the main hydraulic pumps are located in nacelles in each wing and some distance from the centrally located reservoir. With a conventional hydraulic system the suction lines to each pump would be sized for the full system flow and the low line velocity as required in general specification AN-H-2. The piping would be appreciably larger and heavier than the tubing required for the much smaller charge pump flow in the equivalent closed circuit system. Likewise, the charge relief valve return line to the reservoir would carry less flow than a corresponding return line to

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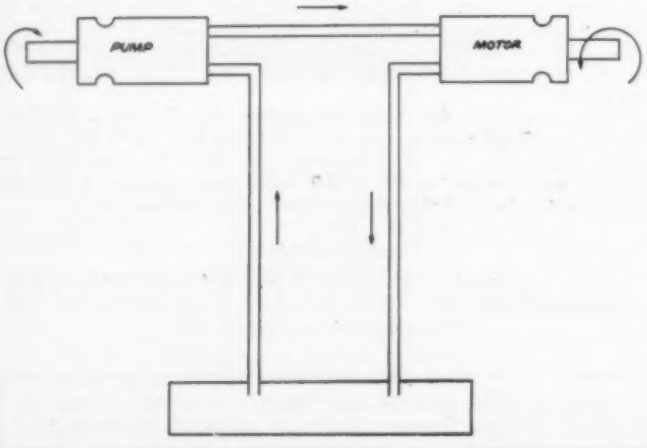

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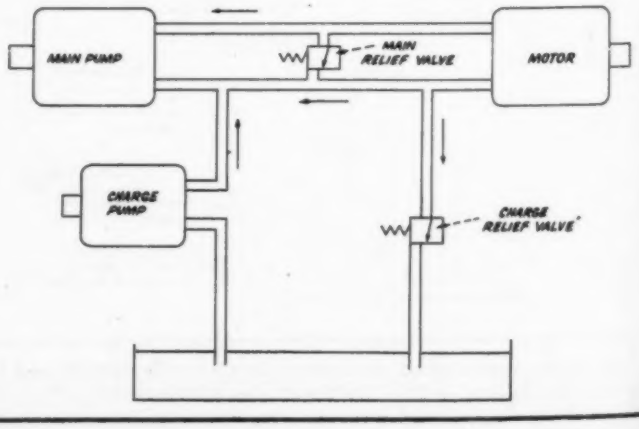

the reservoir in an open circuit system and as a result could be smaller in terms of both size and weight.

In a large hydraulic system with lengthy, large diameter lines, these indicated weight reductions could be so appreciable as to overshadow the added weight involved in the charging pump and charge relief valve of the closed circuit. It is apparent that only a detailed weight analysis of the specific system in the specific airplane could determine the extent to which this would be true.

In addition to the potential weight saving, there is an opportunity for operating the system without the necessity for pressurizing the hydraulic reservoir or, if it is impractical to completely eliminate reservoir pressurization, to use lower reservoir pressures than required with the open circuit system. This is primarily true because the charge pump can be designed with excellent altitude characteristics, since its only function is to deliver oil at a very low discharge pressure to the main pump inlet. To provide equally good altitude characteristics in the main hydraulic pump imposes design restrictions that are usually not compatible with the 3000 psi discharge requirements of the main pump.

An inspection of the circuit in Figure 2 indicates that it would be quite easy to add a filter in the discharge line of the charge pump. A filter located at this point insures clean oil being supplied to the main pump inlet. In a conventional open circuit, a filter located here would be desirable to protect the dirt-sensitive main pump from injurious particles, but it cannot be provided because of the excessive pressure drop which would be imposed in the intake of the main pump. The charge pump, on the other hand, readily produces the required pressure to overcome filter drop and, in itself, is not critical with respect to dirt because it can be designed with the large clearances that are acceptable for the low pressure requirement of the pump. As a service and maintenance aid, the addition of this filter might well be of real benefit.

In a more specialized type of application, the

Fig. 4. The Boeing B-47 strotojets, shown being readied for flight tests, are representative of airplanes with naceles remote from fuselage; a type in which it is advantageous to use the closed circuit system.
Photo courtesy Boeing Airplane Co.

closed circuit has some exceptionally interesting characteristics. The inherent weight saving realized in electrical systems with the use of constant frequency 400 cycle ac power has long been recognized. Generally, the problem has been to provide the required constant input speed to the alternator, utilizing the available power from the aircraft engines, with the engines operating over a wide range of speeds completely unrelated to alternator power and speed requirements*. The hydraulic pump and motor transmission provides an effective solution in all respects except for weight. Even from a weight standpoint in many instances the overall weight, including the transmission, is still favorable compared with other electrical systems. However, the weight advantage can be increased several-fold by drawing oil from the high pressure line for actuation of all components of the general hydraulic system and also by using the transmission for the starting of the aircraft engines. This latter is accomplished by motoring the aircraft alternator as a synchro-

* *"A Constant Speed Drive for Aircraft Alternators", by L. H. Schuette and R. Chrzanowski, APPLIED HYDRAULICS, July, 1949, pp 6-9,22.*

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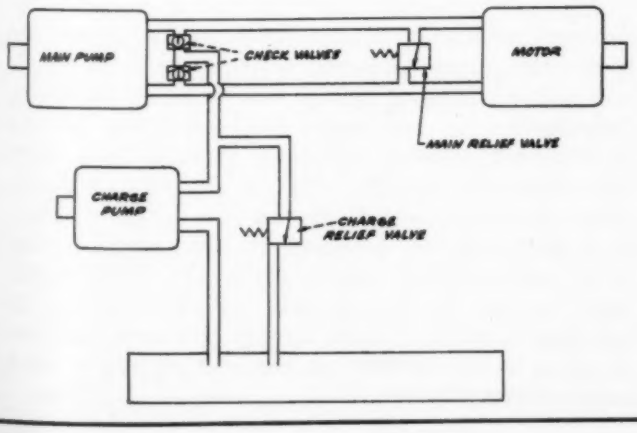


Fig. 1. The elements of an open circuit system, the earliest and most commonly used hydraulic circuit for airplanes. Oil is circulated through the system directly from and returning to the reservoir.

Fig. 2. The basic components of the closed circuit system for aircraft hydraulic circuits; this system offers definite advantages, especially for large aircraft. The auxiliary pump provides makeup oil to the main pump.

Fig. 3. The reversing closed circuit system, with check valves to direct charge pump flow in the appropriate main line circuit, is used in large airplanes as a power source for the starting of aircraft engines.

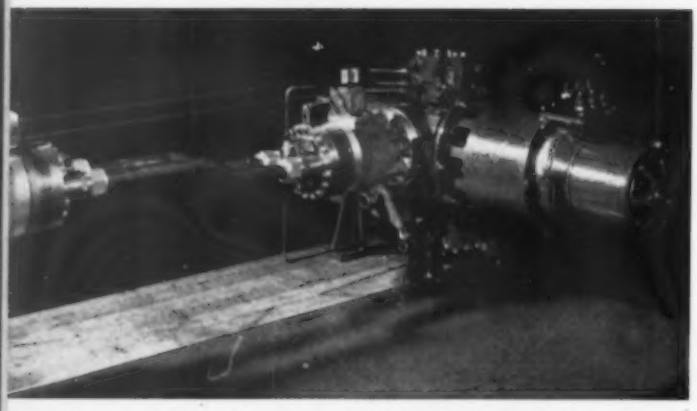


Fig. 5. A 50 hp closed circuit transmission, shown setup for testing, provides engine starting and remote alternator and hydraulic pump constant speed drive. Charge pump and charge relief valves are incorporated in the end caps of the pump and motor units.
Photo courtesy Sundstrand Machine Tool Co.

nous motor and then utilizing the hydraulic transmission in a reverse sense to supply power to the engine, bringing it up to speed, through cranking to idle rpm. An opportunity is afforded for eliminating a separate starter and starting system on the engine and in the airplane. In lieu thereof, equipment already installed in the airplane is effectively utilized.

To incorporate this reverse power function, a version of the closed circuit system is indicated, as shown in Figure 3. In this case, since either main hydraulic line can become the high pressure line, depending upon the flow of power in the circuit, a system of check valves is required to direct the charge pump flow into the appropriate main circuit line. The functioning of these check valves is completely automatic, requiring no attention from operating personnel. The advantage of the closed circuit system in this instance becomes immediately apparent.

It may be of interest to note a few of the design factors pertinent to the closed circuit system. The charge pump displacement is naturally based on the anticipated supplementary flow required to keep the return of the main system filled with oil. The composite of system internal leakages drained to the reservoir and differential flows resulting from movements of single end rod cylinders constitute the two major losses that must be overcome. Other than for weight and space considerations, there is no appreciable disadvantage in sizing the charge pump capacity somewhat in excess of the anticipated maximum system flow requirement. At the low pressure differential under which the charge pump operates, its power requirement and the resultant heating of the system fluid resulting from the energy introduced by the charge pump will be inappreciable in comparison with the main circuit heat rejection.

From the standpoint of charge pump design, the low discharge pressure requirement makes it feasible to use almost any type of pump, provided it has good altitude characteristics and is self-priming. Neither is the location of the pump critical. From the altitude operational standpoint it would be desirable to locate the charge pump in or near the reservoir, but this precludes the use of direct engine drive for the pump and implies using an electric motor driven pump. Generally, it would seem advisable to incorporate the charge pump as a direct adjunct of the main hydraulic pump, taking advantage of the positive engine drive. From a space and weight consideration, this also seems desirable since the charge pump can be included in the main pump housing.

The design of the charge relief valve is not at all critical. Minor variations in the regulated charge pressure are of no consequence in terms of successful main circuit performance, so a simple direct acting valve with comparatively poor regulating characteristics can be used. As in the case of the charge pump, this valve can very readily be incorporated in the main hydraulic pump housing, eliminating unnecessary weight and separate mounting provisions.

Finally, some question may arise as to the applicability of the closed circuit system to the various types of main hydraulic systems in airplanes. It will be remembered that the two types, open and closed center main circuits, have similar reservoir return line and pump suction line arrangements, so no distinction need exist in considering the closed circuit for either of these types of main circuits. Of course, there will be some variation in relation to the required inlet pressure to the main hydraulic pump, depending on whether the pump is constant or variable displacement and on the particular pump design.

Advantages of Closed Circuit

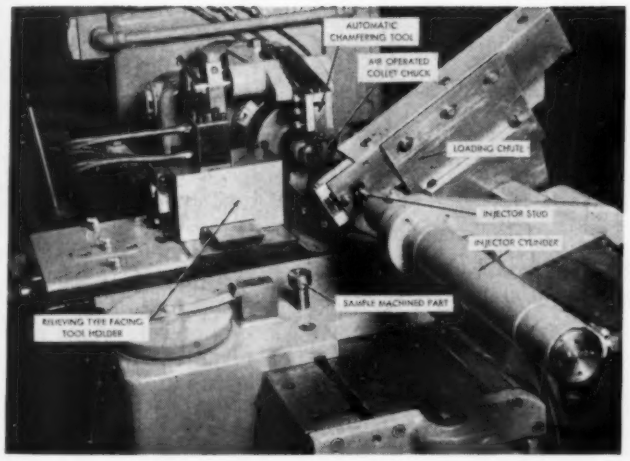
1. **Makes the use of large hydraulic systems practical by reducing the size and weight of piping systems having long lines.**
2. **Permits lowering and possibly eliminating reservoir pressurization.**
3. **Makes possible the use of a filter in the discharge line.**
4. **Eliminates a separate starter and starting system by using check valves in the closed circuit to provide a power source for starting aircraft engines.**

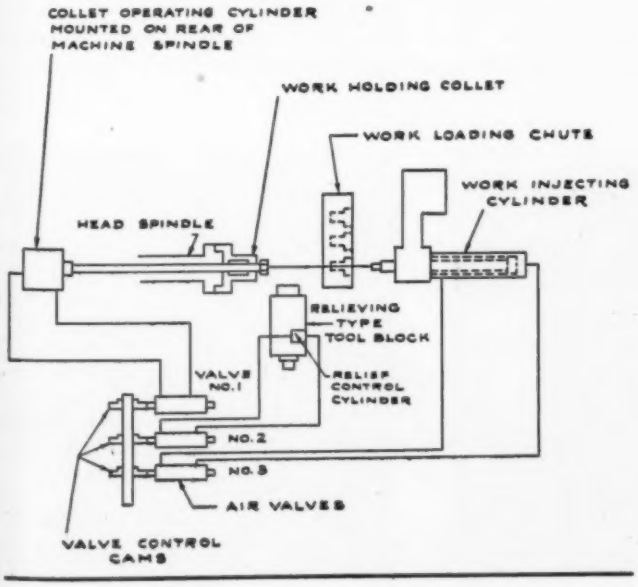
While it is possible to visualize a pressure resonance occurring in the discharge of the main hydraulic pump, induced by the pressure ripple out of the charging pump, the pressure pulsating frequencies of the main and charging pumps would be markedly different. Even if they were the same, the energy level in the charge pump pressure ripple would be too low in comparison with the inherent damping in the charge circuit to be detected and amplified by the main pump. Any concern in this regard can be removed by insuring that the fundamental pressures corresponding to the number of teeth or pistons in each pump are different.

Look to air components

To speed up machine operations

Air Control For Lathe Tooling



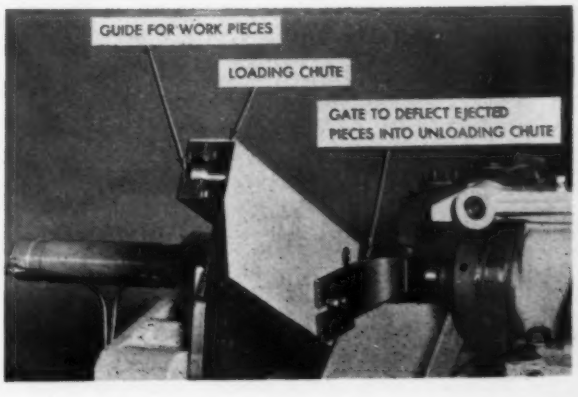


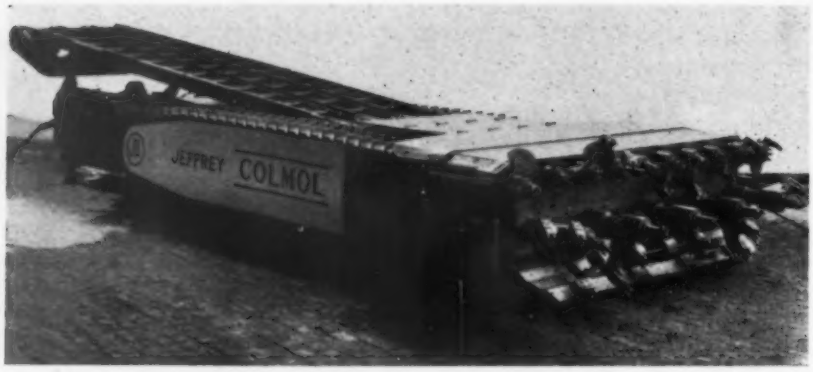
Cam operated air valves control the loading, holding and unloading operations on the Seneca Falls Lo-swing IMP lathes. The arrangement of valves and cylinders provides a completely automatic production machine. The three spool type valves are individually controlled by cams mounted on the cam shaft of the lathe. The headstock spindle revolves continually, even during the loading and unloading phase of the cycle.

Automatic air operated loading permits grouping of machines, since one operator can easily service the loading chutes of several machines.

Valve 3 directs air to work injector cylinder and moves injector stud foreward to place work in collet chuck, which is then closed by action of valve 1. Valve 3 then reverses flow of air to return injector to the loading position. Valve 2 then opens to reset the front facing tool (which is in the relieved position) to cutting position. Upon completion of the facing tool cut and also chamfering operation (made with an automatic swinging type tool block mounted on the headstock) valve 2 reverses flow of air to cylinder in the front facing block and relieves the tool for the return stroke of the cam operated front cross slide.

On completion of the machining operation, valve 1 reverses air flow to open the chuck and work is automatically ejected into the unloading chute by movement of a plunger located in the bore of headstock spindle. After ejection of the finished part, the cycle is repeated.





Coal Mining With Oil

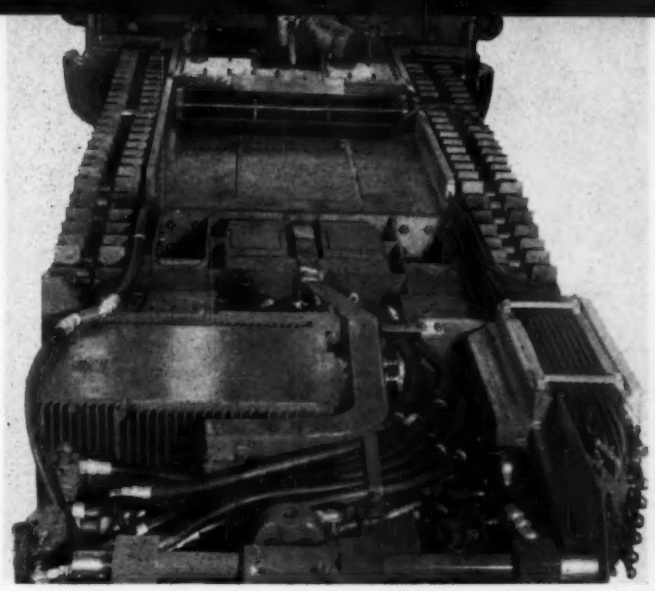
In the mine . . .

• • • a giant mole mounted on caterpillar tracks moves forward into the solid seam of coal, breaking and loading an area of 9½ to 10 feet wide by the height of the seam being mined. Half of the rotary breaker heads turn clockwise and the other half turn counter-clockwise, all turning toward the center of the machine. The rotary breaker heads are positioned in horizontal rows which may be raised or lowered in unison or spread apart to increase or decrease the cutting height of the machine. The heads break the coal out of the solid and • • • • • • sweep the coal toward the conveyor in the center of the unit, where it is picked up, carried to the rear of the Colmol and discharged into the hauling cars. Having a mining capacity of 2 to 5 tons per minute, intermediate haulage is a real problem.

While the unit is very heavy, it is very mobile. The Colmol will turn within its own length and move freely through the most adverse mine bottom conditions. Advancing at a mining rate of 15 to 24 ipm, leaves • • • • • • a floor which is clear and uniform. Very little coal is left lying along the rib or the haulage road; which is a safety feature for it reduces the hazard of fire and explosion.

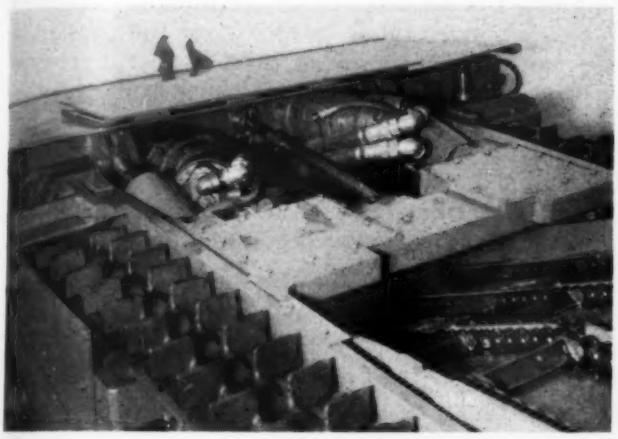
The roof is smooth and the top of the cut may be perfectly controlled. Therefore no unwanted penetration of overlying strata need result. The machine which has almost a level top is rugged and its parts are well protected.

Operation of the Colmol . . .

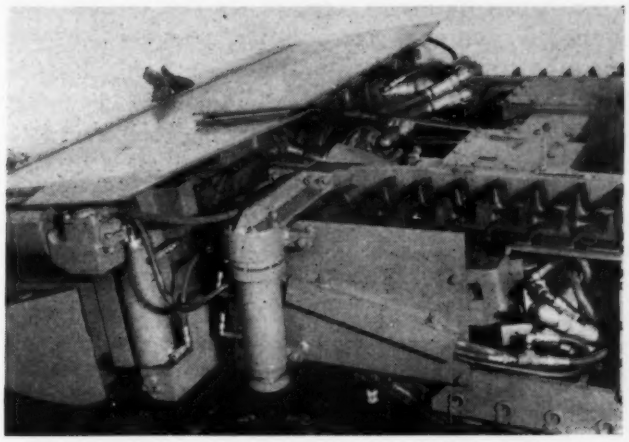


• • • built by the Jeffrey Mfg. Co., Columbus, Ohio, is completely controlled by electro-hydraulic power. Removing the conveyor • • •

• • • and looking toward the front of the machine, shows the hydraulic control lines leading to the rotary and linear motors which power the unit. The caterpillar tracks are driven independently by rotary fluid motors with an infinite speed adjustment either forward or reverse. Maximum tramming speed is 25 fpm and mining feed speed ranges from 0 to 94 ipm. Rotary fluid motors are used • • •



• • • to operate the breaker heads. One motor powers the upper row, the second powers the lower row. Since the lower row of cutters is ahead of the upper row and the two rows overlap for relief, the cutters must be perfectly timed to prevent interference. Timing gear boxes are used to keep the heads in synchronism.
Linear fluid motors or jacks • • •

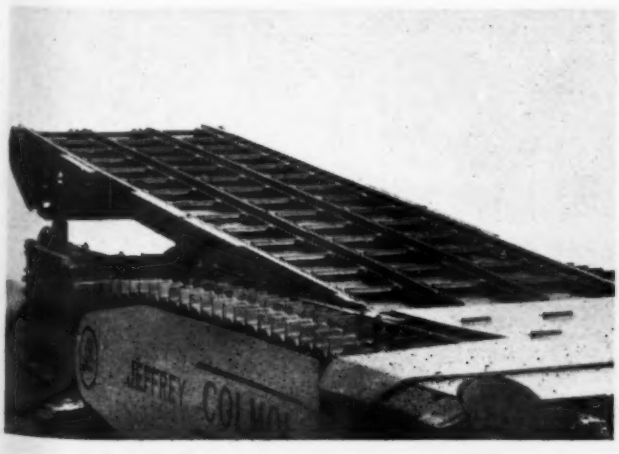


• • • raise and lower the gear cases in which the breaker heads are mounted. The hydraulically controlled motion adjusts the height of the cutters for the coal seam; permits tilting the heads to square the cutters with the seam and to follow the contour of the seam. The jacks can be used to elevate the entire head when desired. While digging, the conveyor • • •

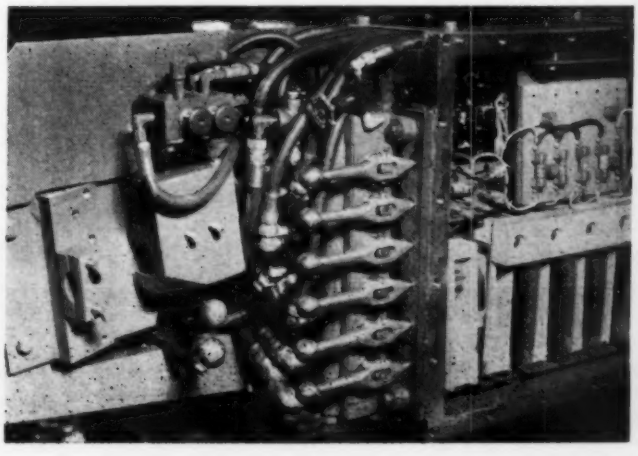
• • • is in the up position, giving space for a shuttle car to catch the coal. For tramming the conveyor is lowered to the horizontal position. A fluid motor drives the conveyor sprocket.

Lift jacks, two in the front and two in the rear are included to lift the entire machine.

All operations are • • •



• • • controlled from this station, at the operator's position in the rear of the machine. From top to bottom, using the six horizontal levers, the operator can— raise and lower heads — separate heads — tilt heads — raise and lower conveyor — move rear jacks — move front jacks. The two levers on the left control the traction.



DESIGN of the C

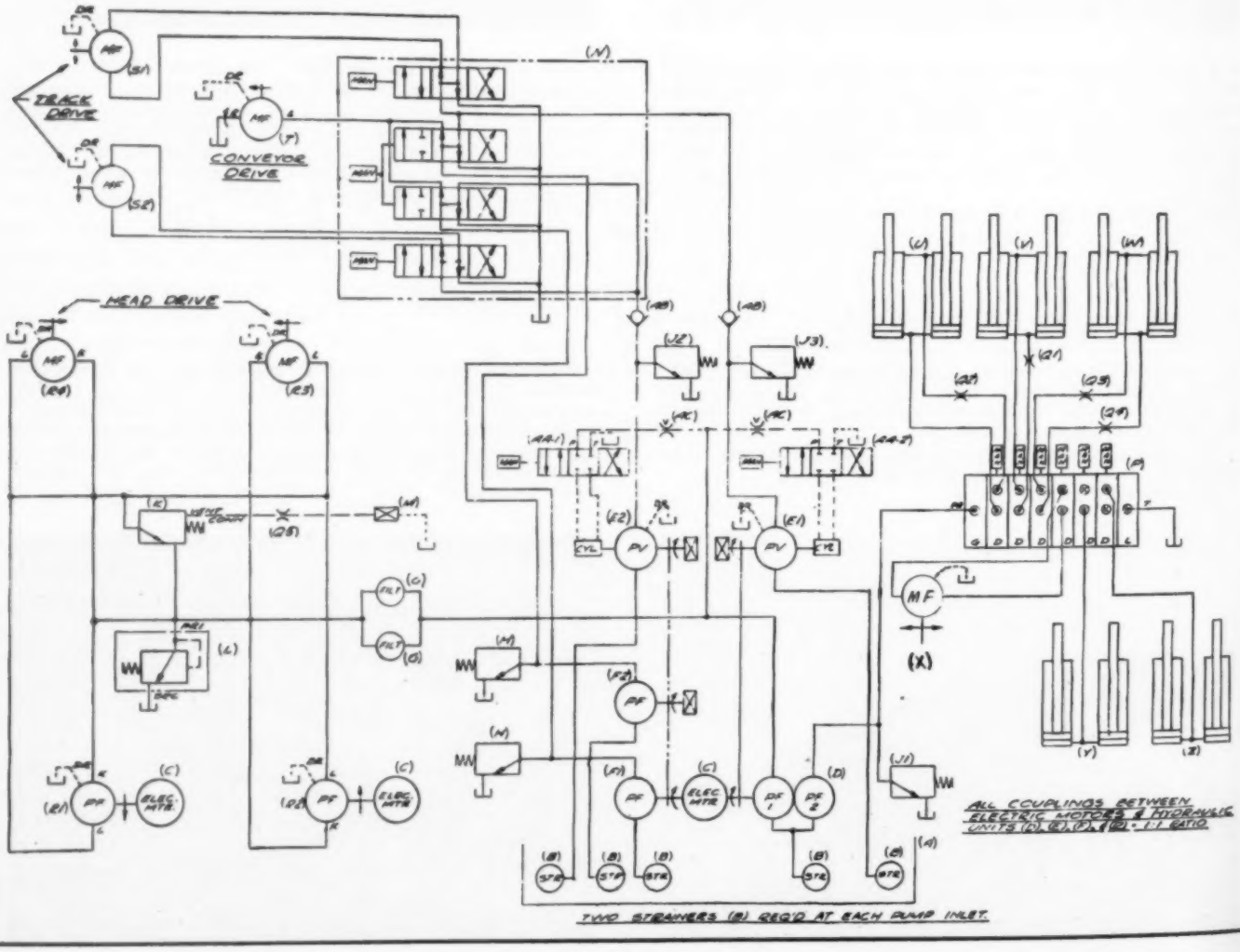
DESIGNERS OF HYDRAULIC SYSTEMS FOR COAL mining equipment must consider several important problems:

1. Space limitations are extreme in coal mines. It is necessary to keep the number of valves and size of the pumps and fluid motors at a minimum.

2. Maintaining the oil at optimum working temperature is made difficult by the limited size of the oil reservoir. No practical means of cooling the oil is available. Therefore, to meet this requirement, there must be a highly efficient hydraulic system in which a minimum amount of power will be dissipated into heat. For this reason, in the Colmol, piston type pumps and fluid motors are used wherever high horsepower is transmitted.

3. To decrease maintenance cost and downtime of the Colmol, it is essential that the hydraulic equipment be accessible. This presented a problem due to the limited space available for mounting the various units. To overcome this, several of the operating valves and check valves were combined into a single bank and placed in such a manner under the conveyor that it is accessible by merely raising the conveyor to its maximum height. Converting to mechanically operated valves has been made to eliminate the possibility of malfunctioning of pressure operated type valves due to foreign material in the oil.

In the past the greatest disadvantage of hydraulically operated coal mining machinery has been coal dust in the oil. The greatest portion of the coal dust has been eliminated by introducing micronic continuous type filters in the system.


TRACK DRIVE
CONVEYOR DRIVE
HEAD DRIVE
MF
(X)
ALL COUPLINGS BETWEEN ELECTRIC MOTORS & HYDRAULIC UNITS (A), (B), (F) & (G) - 1:1 RATIO.
TWO STRAINERS (B) REQ'D AT EACH PUMP INLET.

the COLMOL'S HYDRAULIC SYSTEM

Since August of last year, the machine that the Sunnyhill Coal Company uses has been in operation without a serious breakdown in the hydraulic system. Each time that the machine is out of the mine the system is inspected and has always been found to be in a surprisingly clean condition.

The Colmol system can best be described by considering three separate circuits:

1. Cutter Head
2. Traction drive and conveyor drive
3. Lifting jacks

1. The cutter heads are driven by two fixed displacement piston type fluid motors. Each motor drives half of the cutters and is capable of transmitting 75 hp.

The relief valve (K) for this closed circuit is set at 2200 psi. This valve is vented by a shut-off valve to provide a means for stopping the cutter heads without stopping the electric motors that drive the head circuit pumps. At the time that the relief valve is vented, oil is merely circulated through it and back to the intake ports of the head circuit pumps at negligible pressure. Another important advantage in being able to vent this circuit is to permit the electric motors driving the pumps to be started under no load.

Due to the fact that the head circuit is a closed circuit, meaning that the oil travels from the outlet port of the pump through the fluid motor and back to the inlet port of the pump, it is necessary to provide some oil to supplement the oil that is lost due to internal leakage of both the pump and fluid motor. The operation of the supercharge pump (PFI) is to provide make-up oil for the inlet ports of the head circuit pumps under minimum pressure.

By supercharging the inlet ports of the pumps, not only does it provide make-up oil for that amount which is lost due to internal leakage, but it also allows the pump inlet ports to be placed under pressure so that the pumps can be operated at a higher speed. This also prevents the possibility of cavitation which would be present if the system were operated under atmospheric pressure. Consequently, a greater horsepower output can be obtained from the same size units.

The pressure of the supercharged oil is determined by the setting of the relief valve on the exhaust side of the fluid motors. In most applications, this pressure is approximately 50 psi. However, due to the line losses in the Colmol, it requires from 100 to 125 psi.

2. Two fluid motors drive the tracks and a third motor drives the loading conveyor. The combined available power is 36 hp. The operation of pumps (F1) and (F2) is such that when the machine is in motion and not cutting coal, which is known as tramming, the volumes of these pumps are directed to the traction motors thus providing considerably greater speed during the time the machine is being moved from place to place and no actual work is being done. During this time the conveyor motor is not in operation. When the machine is cutting coal the volumes of these pumps are directed to the conveyor motor for operation. This arrangement allows dual operation from the fixed displacement pumps.

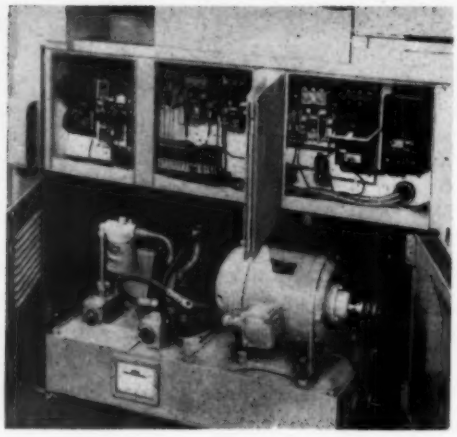
3. All the jacks operate on pressure oil which is delivered from the high pressure, low volume side of the combination pump (D). This circuit includes an application of a multiple unit valve which provides compact control for each jack. Fixed restrictors (Q) in the rod end lines assist in providing smooth lifting action.

The conveyor lift jacks are mechanical screw type, operated by a rotary fluid motor (X). This system provides for positive locking of the conveyor position on the screw threads.

Circuit Components

A—Reservoir 300 Gal Cap
B—Strainer
C—Electric Motor 50 HP 1200 RPM
D—Double Pump 18.8 gpm (PF-1) 5.0 gpm (PF-2)
E—Var. Deliv. Pump 20 gpm max
F—Pump 29.1 gpm
G—Filter 14 gpm
H—Relief Valve
J—Relief Valve
K—Relief Valve
L—Relief Valve
M—Needle Valve
N—Special Valve
P—Multiple Unit Valve
Q—Fixed Restrictions
R—Fluid Motor
S—Fluid Motor
T—Fluid Motor
U—Cylinder Upper Bank Head
V—Cylinder Head Raise or Lower
W—Cylinder Head Tilt
X—Fluid Motor Conveyer Jacks
Y—Cylinder Front Jacks
Z—Cylinder Rear Jacks
AA—Directional Valve
AB—Check Valve
AC—Needle Valve

APPLIED HYDRAULICS thanks W. J. Phillips of the Sunnyhill Coal Company and C. J. Cannon of Vickers Inc. for their valuable assistance in the preparation of "Coal Mining With Oil".



CENTERLESS GRINDER. A depth type fibre mass filter with a 25 mircon cartridge is part of the power unit handling fluid on a by-pass circuit.. Complete clarifiation of total fluid periodically, protects the system.

Oil Filters — What They Are . . . How and Why They Are Used . . .

By D. G. VAN VLECK

NO SINGLE FILTER WILL SOLVE ALL YOUR FILTRAtion problems. But, if you know what a filter will do, what types are available and can analyze your requirements, you will be able to select the correct filter for your job.

Filters may be grouped into two general classes: depth types and space types.

Depth types are those filters which offer a relatively long path for the passage of fluids and stop solids by entangling them within the mass of the filter media structure. The class may be further divided into the following groups:

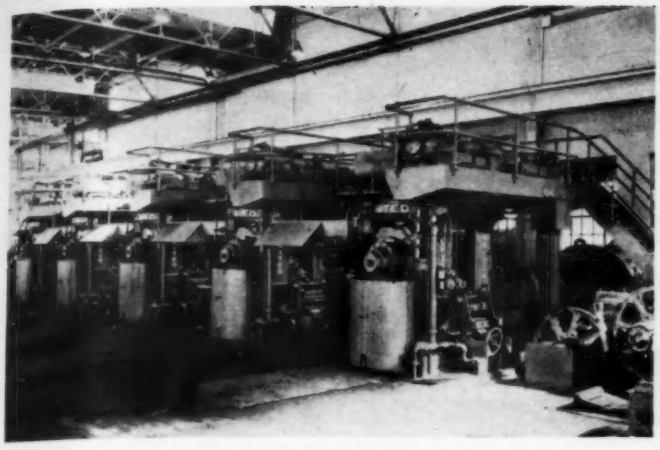
1. *Fibre mass types* cover those filters whose element or cartridge consists of a loosely packed accumulation of fibrous materials, such as felts, horse hair, cotton waste and impregnated molded fibre;
2. *Ceramic types* are those whose filter media is a porous ceramic structure. Porous metals may be included;
3. *Precoat types* are those which build up a temporary filtering bed on some supporting structure (wire cloth, canvas, paper, etc.). The bed is destroyed and rebuilt as part of the cleaning

FILTER CLASSIFICATION

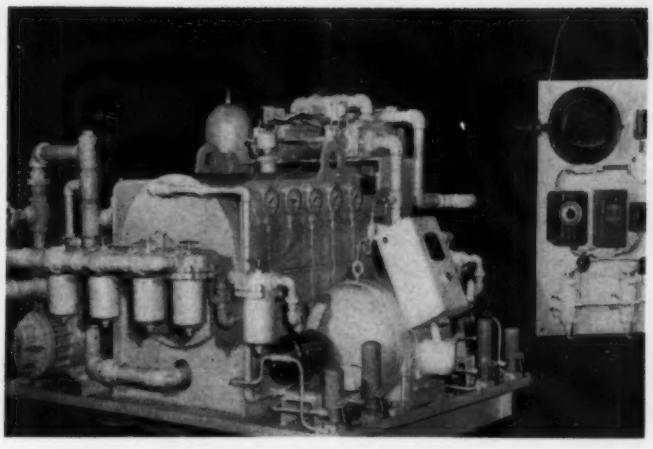
FILTER GROUP		TYPE OF CONTAMINENT								
		ABRASIVE			GUM & GOO			FIBROUS		
		REMOVAL	LIFE	COST*	REMOVAL	LIFE	COST*	REMOVAL	LIFE	COST*
DEPTH TYPES	FIBRE MASS	GOOD	FAIR	MED.	GOOD	GOOD	MED	EXCELL.	MED	MED.
	CERAMIC	GOOD	LOW	HIGH	GOOD	POOR	HIGH	EXCELL.	MED.	MED.
	PRECOAT	EXCELL.	LOW	HIGH	EXCELL.	MED.	HIGH	EXCELL.	HIGH	HIGH
SPACE TYPES	SCREEN AND BAG	FAIR	POOR	MED.	POOR	POOR	MED.	GOOD	SHORT	HIGH
	EDGE-SCRAPER	FAIR	POOR	MED	FAIR	POOR	MED.	GOOD	SHORT	HIGH
	EDGE-COMB	FAIR	POOR	HIGH	FAIR	GOOD	LOW	GOOD	SHORT	MED.
	BACKWASH	GOOD	EXCELL.	LOW	POOR	POOR	HIGH	GOOD	SHORT	LOW

*COST REFERS TO OPERATING COST, NOT INSTALLATION. INCLUDES REPLACEMENT OF CARTRIDGES OR PRECOAT LABOR, OR MAINTENANCE OF ALL METAL TYPES.

Table I. When each common contaminant is met separately, the chart presents a useful guide of the relative merits for the various types of filters. For a combination of contaminants, proper analysis will aid in the choice of a filter.



ROLLING MILL. Space type backwash filters remove contaminants that would otherwise mar roll finish. Roll body coolant is circulated from storage through filter to mill and back to storage at approx. 500 gpm.



HYDRAULIC POWER UNIT. Five space type comb filters, each handling up to 25 gpm, are located on the suction side of the pumps with 10 to 18 inches positive head.

cycle. A filter aid, such as a diatomaceous earth, is mixed with the fluid to be filtered. . When passed through the filter, a cake or a bed is formed, consisting of the filter aid and the material to be removed. The filter aid keeps the cake open enough to permit the liquid to pass, but is dense enough to stop filterable material. Usually, precoating is done until the desired clarity of filtrate is obtained, then the filtrate is diverted for use. The filter is cleaned by backwashing or disassembly. Automatic or continuous operation is difficult to obtain.

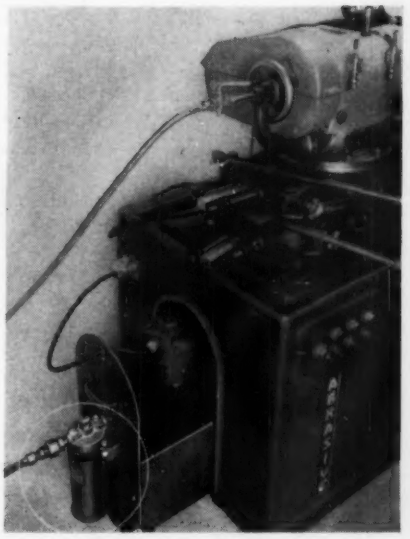
In space type filters the media offers a relatively clear, straight path for the fluid and stops solids that are too large to pass the opening offered. They may be subdivided into the following groups:

1. Screen, bag or pot types, requiring removal from service for cleaning.
2. Scraper types, cleaned in service by a doctor blade.
3. Comb types, cleaned in service by mechanical combing of free area.
4. Backwash types, cleaned by reverse flow of a portion of the element or elements in sequence.

Filters, applied to hydraulic equipment, are used to provide and maintain fluids free from solids. Unwanted solids in industrial fluids can be divided into three classes: abrasives; gums or goo; and fiber.

Abrasive contaminants are hard solids which promote wear by direct cutting action and by disrupting the film of lubrication. In non-lubricating services, abrasives cut out orifices and nozzles, making controls erratic.

Gums or goos are sticky and gelatinous and are non-abrasive in character. They plug openings, restrict flow and act as binders to retain abrasives.



ABRASIVE CARBIDE FINISHER. A depth type fibre mass filter removes particles down to less than five millionths of an inch. Filter handles one to four gpm at about 3 psi.

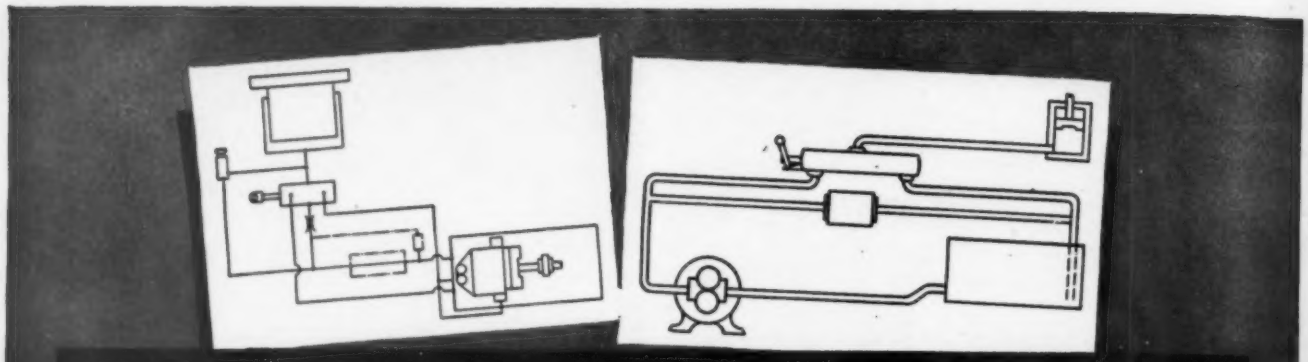
Lint is a fibrous contaminant which adds a supporting structure to retain abrasives and gums. When only one type of contaminant is present in a circuit, the problem of removal is not difficult.

Table I shows the relative merit of the various types of filters for removing each common contaminant when they are met separately.

Unfortunately, the contaminants seldom travel alone. The filter must cope with all three in the same system. Using three separate filters would be costly and ineffective. A screen that would stop lint would be plugged by goo. A fibre mass filter that would stop goo effectively would be loaded by abrasive, the lint would provide support to enable the goo to "plaster". An edge type filter with combs would remove gums, goo and lint, but abrasives would soon wear the filter.

As a team the contaminants are tough. Some compromise must be made between the cost of filtering, cost of replacing equipment and the

(Concluded on page 51)



A Beginner's Course in Basic Hydraulics

Chapter VII

DIRECTIONAL VALVES

Part 5

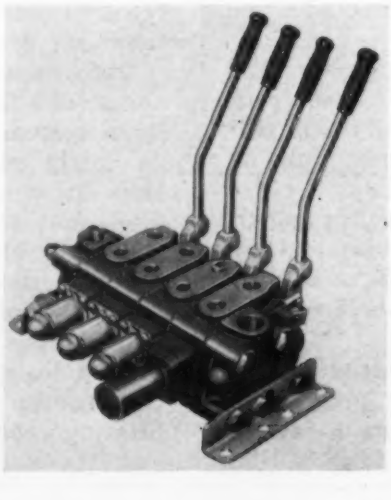
Valve Blocks and Panels

THE VARIED AND DELICATELY controlled operations performed by hydraulic systems in industry often depend upon quite complicated combinations of pumps, valves, mechanical parts and electrical circuits. Such systems must be constructed so that they are easily controlled and so that they will operate with a minimum of service and maintenance.

Valve blocks. In many circuits it is expedient to group a number of units together. This tendency is a growing one since it normally gives advantages of convenience for operation and service, simplicity in installation and economy of pipe or tubing. Valves closely related in a series of operations may be organized into a valve block, the different parts of which may be connected not only hydraulically but mechanically and electrically, so that the valves may be brought into position in any of these three ways.

Figure 110 shows a typical valve block or multiple valve unit. Note that identical valve bodies are used for single and double acting units; one port is plugged in the single action units. Figure 111 is a schematic sketch of a multiple valve unit assembly for operating both a body hoist ram or cylinder and a double acting cylinder which powers a plow or scraper.

Fig. 110. A typical Vickers multiple unit valve. This unit is composed of an overload relief valve, three double-acting valve units, one single acting unit and an end plate.



Combining different work operations. In many industrial hydraulic installations, it is desirable to have a comparatively large volume of oil available under relatively low

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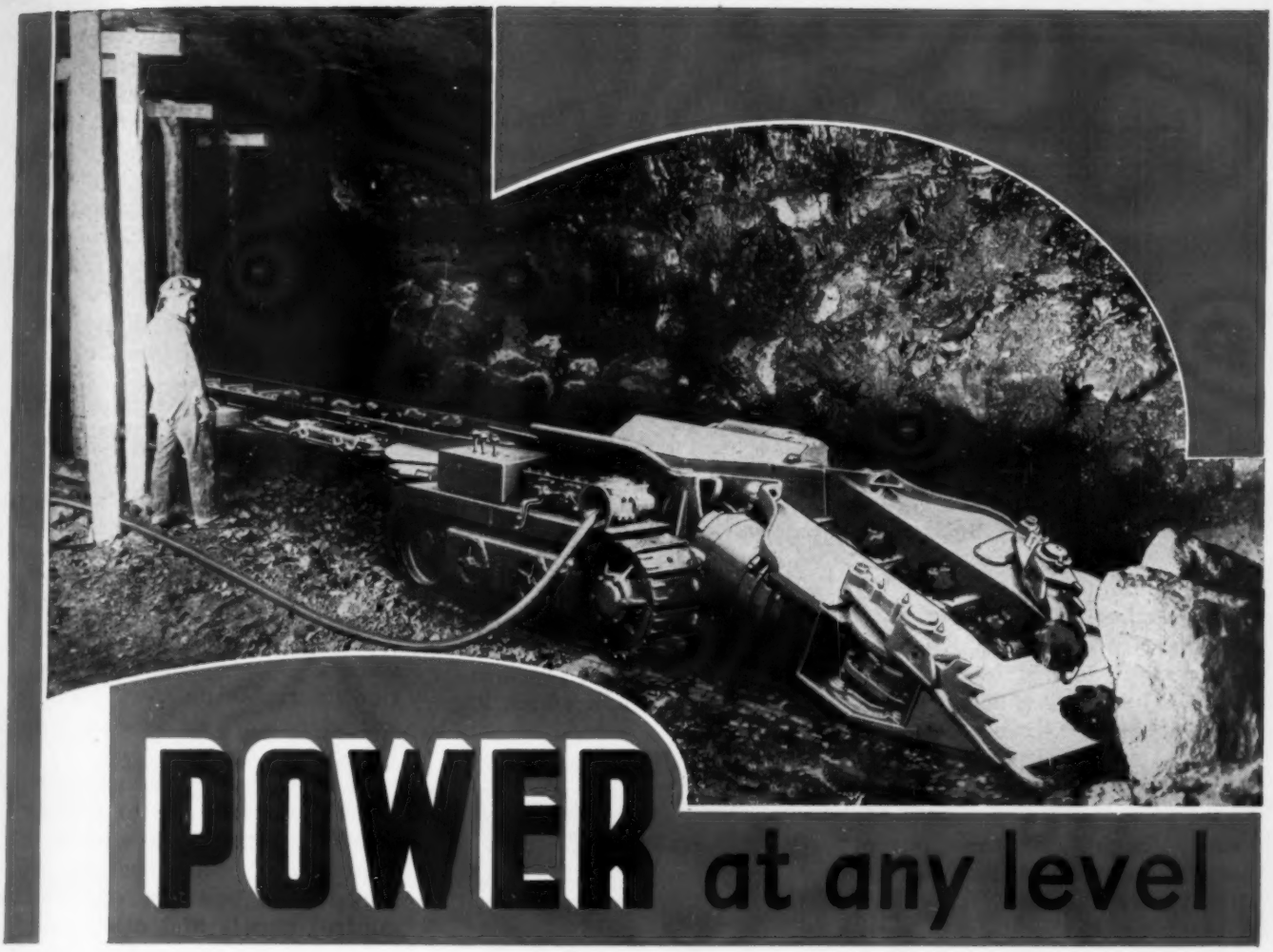


POWER at any level

OIL HYDRAULIC PUMPS MOTORS VALVES CYLINDERS

You'll find them digging coal in the deepest mine; opening the highways after a bitter blizzard; logging in the roughest terrain; or blazing a road through a high mountain pass. Wherever the going is tough and rugged machines are on the job, that's where "Commercial" Hydraulics meet the test and like to work.

Controlled quality has established the leadership of "Commercial" Oil Hydraulic Products in the fastest growing field of power transmission.

Gear type pumps, discharging up to 75 g.p.m. at 1500 p.s.i. pressure, develop power; solid spool unit or tandem valves direct the flow of this unrestricted power; single or double acting cylinders use this power — a complete hydraulic circuit that will do a lot of work efficiently, economically, and hydraulically.

THE COMMERCIAL SHEARING & STAMPING CO. • YOUNGSTOWN, OHIO

QUALITY IN EVERY TURN

"COMMERCIAL"

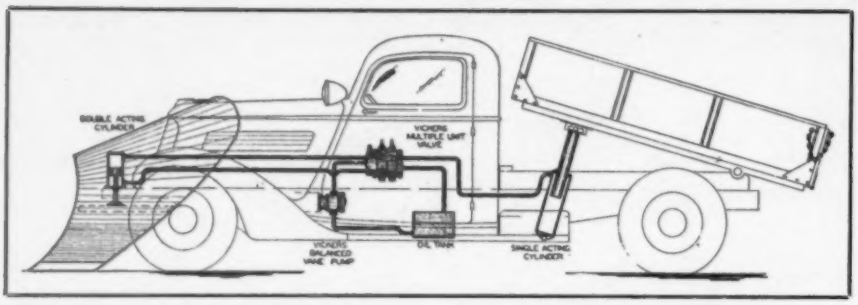


Figure 111. A multiple unit valve assembly used to operate a hoist ram and a blade or scraper. The assembly (left to right) is an overload relief valve, a double-acting unit connected to the front cylinder, a single acting unit piped to the hoist ram and an end plate with return connection to tank.

pressure at one phase of the cycle and a smaller volume of oil under higher pressure at another phase.

A number of solutions to this problem are possible. One arrangement makes use of the prefill check valve, as shown in Figure 105 (October installment). A second arrangement uses a large volume, low pressure pump and a smaller volume, high pressure pump working together to produce the desired result.

Delivery of oil from both pumps goes to the work area until a pressure is built up which is strong enough to open the unloading valve; at this point high pressure from the small pump closes the check valve and oil from the large pump is diverted to the reservoir. High pressure delivery goes on continuously; it is joined by low pressure delivery when pressure in the system drops below the pressure setting of the unloading valve. The overload relief valve is set at the pressure above which it is not desired that oil be delivered by the small volume pump.

Self Contained Combination Valves

Combination valves may, of course, be designed and built into a single unit housing. Figure 112 shows an Oilgear combination valve with "three" way reversing plungers; this design provides controlled, cushioned reversal of high speed oil power operated reciprocating drives. This type is used with variable delivery pumps and differential double-acting cylinders on a wide variety of machine tools and production machines which reciprocate at high speeds and in which it is

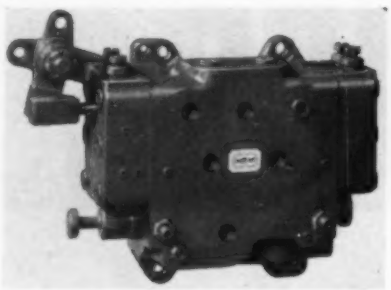


Fig. 112. Front view of Oilgear combination valve with "three" way reversing plungers; these valves provide controlled, cushioned reversal of high speed reciprocating drives.

essential that reversal be controlled without shock or delay. Pipe taps are available on both sides. All piping can be installed inside the machine or put out in the open.

This type of self-contained valves combine pilot, reversing and inching plungers in one compact, unit, greatly simplifying the installation and reducing tubing or piping to a minimum. The pilot plunger is actuated by a simple cam, dog or electric mechanism; a hand or foot operated lever moves the start, stop and inching plunger. The reversing plunger is operated automatically by oil from the pilot plunger.

Panels. Still other arrangements have been devised for combining the results obtainable with different volumes of delivery. Some of these systems are organized so that they can be controlled by panels like that shown in Figure 113, where movement of the panel lever controls the action of the system for advance, coarse feed, fine feed, stop and return, according to the setting given to the control dials on the face of the panel.

Panels can be used with either a single constant delivery pump or with two constant delivery pumps — one delivering low pressure and one delivering high pressure or with a single variable delivery pump capable of supplying different volumes of oil without changing its speed of operation. Variable delivery pumps will be described in detail in latter chapters.

Various types of panels have been developed by individual manufacturers. Traverse and feed control, reciprocating cycle panels, solenoid operated control panels and others are available for simplifying circuits. Panels will be treated in more detail later as integral parts of circuits.

The installment in December will conclude the Chapter VII on Directional Valves. Be sure to save each installment for future reference.

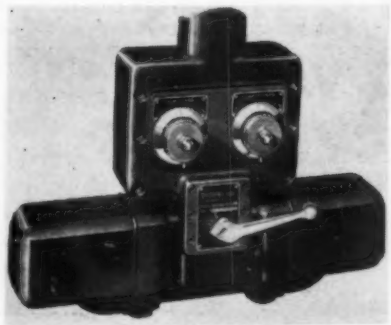
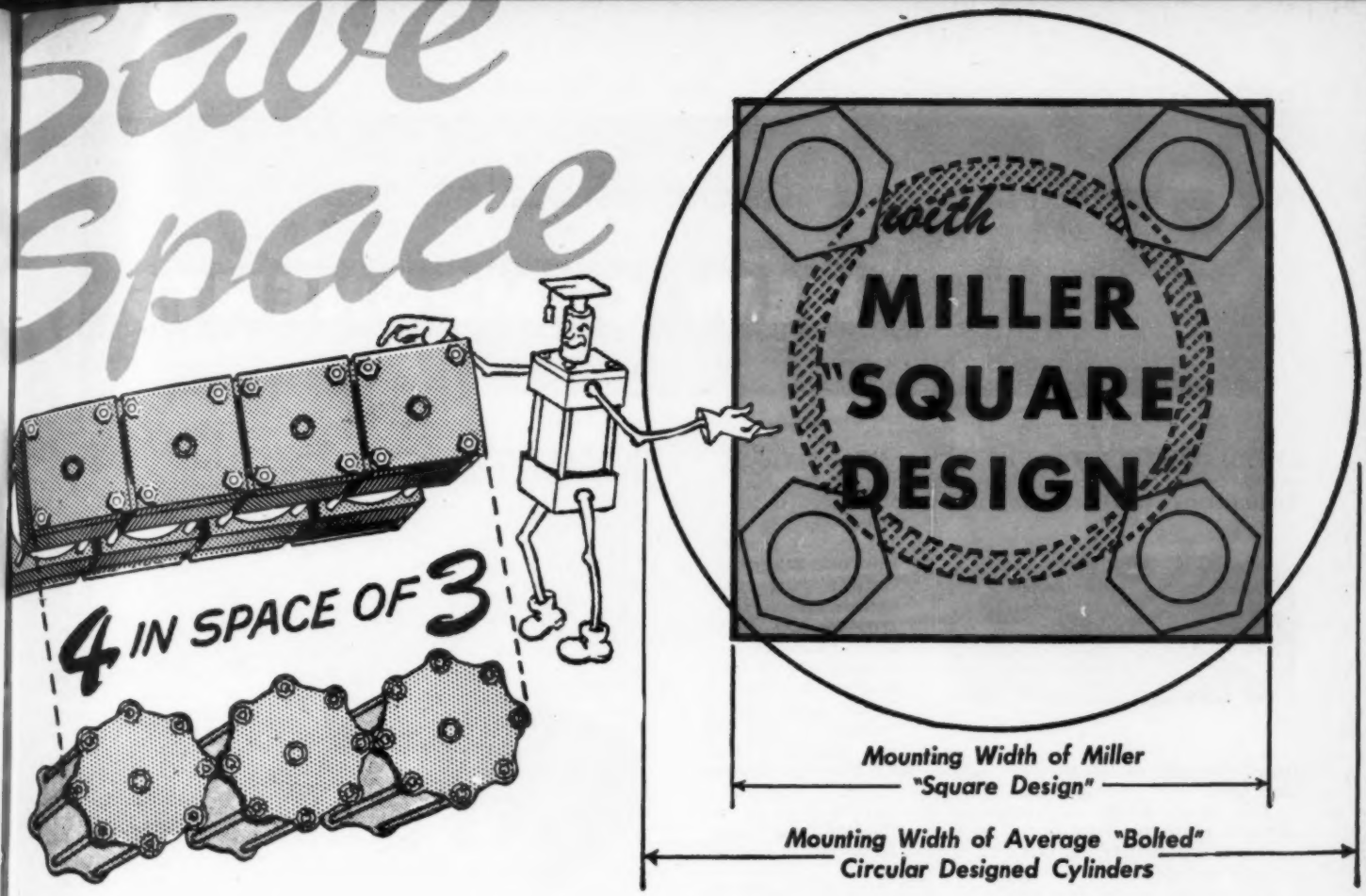


Fig. 113. The Vickers double closed solenoid traverse and feed cycle control panel provides any cycle sequence of rapid advance, adjustable coarse feed, adjustable fine feed and rapid return motions. The control lever can be utilized independently for complete cycle control; it is convenient for set-up purposes, emergency stop or return.

Save Space



Air *and* Hydraulic CYLINDERS...

Benefits to You!

- More Cylinder Power in Same space
- Solve "Limited Space" Problems
- Simplify Designing and Installation
- Save hours of Drafting Time

The SQUARE DESIGN of Miller Cylinders saves up to 25% of mounting space, permitting more cylinder power in the same space and easier, more convenient installation in "tight spots." Thus, in many cases, machines and equipment can be designed more compact and less costly by using Miller Cylinders. Hours of drafting time can be saved — as only a few straight lines show any view on drawings.

The illustration at upper left shows graphically how *four* Miller Cylinders can be mounted, bore for bore, in the same space required for *three* average "bolted" circular designed cylinders. Some Miller bore sizes permit even greater space-savings.

Other important *standard* features of all Miller Cylinders include: solid steel heads, caps and mountings, hard chrome plated piston rods, dirt wiper seals, and other "quality" features as shown in illustrated bulletins sent FREE on request. Remember, too, that Miller Hydraulic Cylinders (2000-3000 psi) meet the J. I. C. Hydraulic Standards.

Write for illustrated cylinder bulletins A-105 and H-104

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

4029 N. KEDZIE AVENUE, CHICAGO 18, ILLINOIS

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

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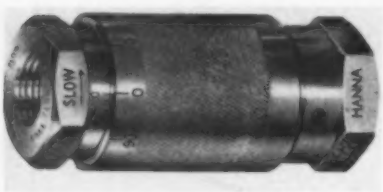
Sales and Service from coast to coast

Circle 16 on Reader Service Card

application and performance of NEW COMPONENTS

SPEED CONTROL VALVES — New line of "Flo-Set" speed control valves has been announced by Hanna Engineering Works. The valves, available in three sizes—¼, ⅜ and ½ in. — feature micrometer graduations for precision speed control of low pressure cylinders. A fourth speed control valve, the ¼ in Jr. specifically designed for use with tubing, functions the same as the larger size Flo-Set valves but does not include the micrometer adjustments.

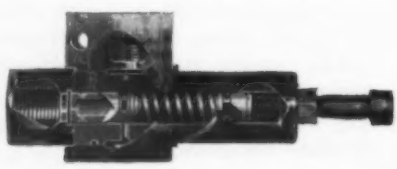


The new valves are suitable for air, water or oil control, with maximum pressure to 250 psi, and maximum temperature to 250 F. They may be mounted in any position.

All metal parts are made of aluminum except for stainless steel springs. Seals and poppets are of molded synthetic.

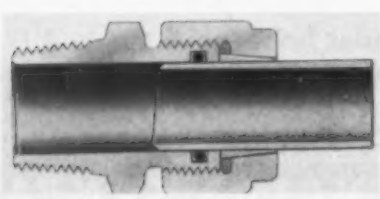
Circle 101 on Reader Service Card

ADJUSTABLE FLOW REGULATOR — Waterman Engineering Company has developed an adjustable flow regulator for cylinder speed control. This adjustable regulator gives a constant rate of flow regardless of pressure fluctuations or change in work resistance at any setting within the adjustable range. Adjustable range is 50 percent of the calibrated flow rate in gpm. It is available for hydraulic systems with operating pressures to 3000 psi. Line sizes are ¼, ⅜, ½ and ¾ NPT (dry seal). Maximum controlled flow is 16 gpm.



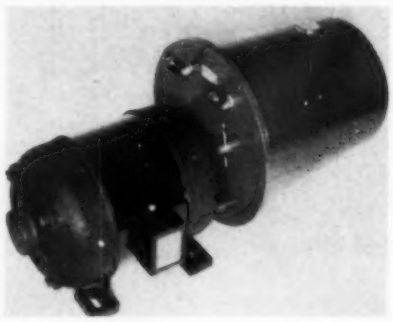
Circle 102 on Reader Service Card

"O" RING TUBE COUPLING — Use of an "O" ring in the Lenz Company's tube coupling provides an easily assembled connection for hydraulic systems. The tube is held by friction grip between the nut and taser sleeve. With the "O" ring providing the seal, excessive wrench torque is unnecessary because the seal does not depend on the tightness of the nut. For assembly, the tube need not be cut square or to any exact length. Filing a chamfer on the tube end, to prevent shearing of the "O" ring is the only preparation required.



Circle 103 on Reader Service Card

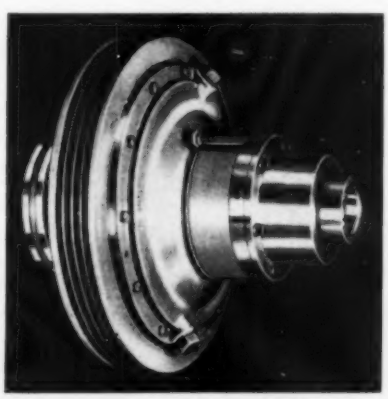
MIDGET HYDRAULIC PUMPING UNITS — Readily adaptable for portable applications, such as experimental work, or as a substitute for compressed air, a new line of midget hydraulic pumping units has been brought by the John Dusenbery Co. Standard units are available with either a 5 pint or a 3 gallon capacity reservoir.



The reservoir is mounted on either an open, a totally enclosed, or an explosion-proof motor, and the pump, check valve, and relief valve are enclosed. Both reservoir and bulkhead are made of aluminum, and units with open motors have aluminum motor frames. Pressure and return line connections are for ⅜ o.d. flared tubing, but ¼ in. pipe thread or ¼ in. hose coupling connections can be supplied on special order. Output volumes range from 1. gpm to 2.8 gpm, pump pressures are pre-set at the factory according to customer specifications.

Circle 104 on Reader Service Card

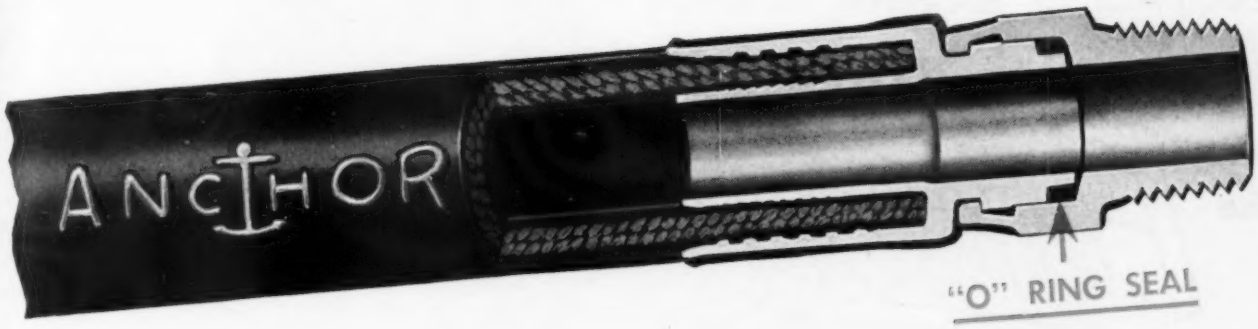
MAGNETIC PARTICLE CLUTCH—The first commercially-usable magnetic-particle clutches have been introduced by the Vickers Electric Division with its new line of Magneclutches and Magnebrakes. First developed for use by the Navy for more efficient operation of ship board equipment. Magnaclutches and Magnebrakes are now in production for use by industry for control of torque, speed and position. The Magneclutch is a controllable coupling which utilizes the linking action of a dry magnetic mixture in a magnetic field between driving and driven parts to transmit torque. The magnetic mixture is composed of iron particles and flake graphite. The magnetic field is established by current flowing through a coil, and by varying the current the degree of clutching can be controlled. Design and operating advantages offered by the new clutch include: small control power with extremely fast response, no wear on torque transmitting surfaces, large maximum to minimum torque ratio and easy adaptation to remote control.



Circle 105 on Reader Service Card

SEALED FOR KEEPS!

WITH THIS "O" RING SEAL



The swivel fitting on this hydraulic hose coupling manufactured by the ANCHOR COUPLING COMPANY INC., of Libertyville, Illinois, pioneers the use of an "O" Ring Seal for easy movement and positive sealing.

Use of this swivel male pipe thread coupling at one end of a hose assembly simplifies installation by eliminating one threaded joint and the usual pipe union. It avoids torsional strain because it permits the hose to assume its natural position when pressure is applied.

Since the coupling components are not only permanently swaged to the hose but also to one another, the sealing member must be 100% dependable right from the initial assembly. An "O" Ring from Precision Rubber Products Corporation proved to be the best packing obtainable for the leakproof and trouble free sealing.

PRP "O" RINGS *meet all J.I.C. Standards*

Investigate PRP "O" Ring Seals today—send for your free copy of our "O" Ring Handbook

It permits easy swiveling during hose installation assuring minimum wear and maximum seal life.

Space saving, leakproof "O" Ring Seals have solved countless design and production problems throughout industry. Write today to learn what PRP Engineers can do to help make yours a better product at lower cost.

Precision Rubber Products
CORPORATION
The "O" Ring Specialists
Formerly Plastic & Rubber Products, Inc. Dayton, Ohio
Dept. 1, Oakridge Drive, Dayton 7, Ohio

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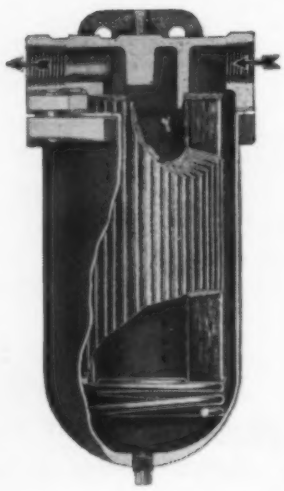
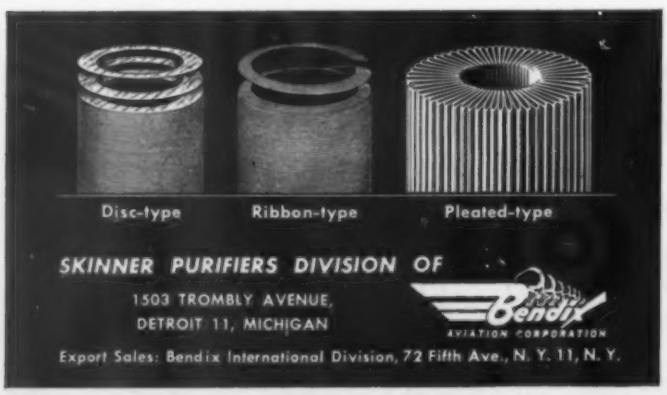
Results Prove It

the *Finest* Name in Filtering

Nine times out of ten ***Bendix-Skinner*** Filters will supply the "finest" answer to your filtration problems. Here are the facts: available with patented, exclusive, resin impregnated cellulose elements; simple, quick replacement; high flow rate with minimum pressure loss; no channeling or bypassing; over 350 models providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g.p.m. Why not let ***Bendix-Skinner*** filtration engineers work with you? Write us direct.



Model 3110-P filter element, 6⅛" x 3½", has a filtering area of 940 sq. in.!



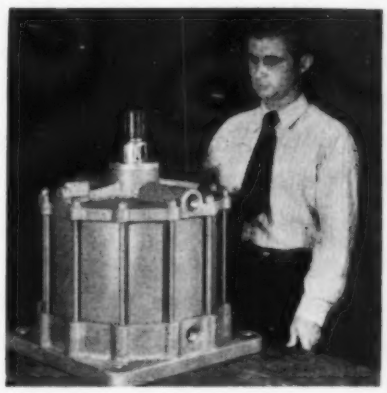
Circle 18 on Reader Service Card

"PENDULUM ACTION" PUMP — Hydramite fluid power is a new radial piston, constant displacement, oil-operated pressure generator. Developed by the American Engineering Company the pump is warranted to discharge oil continuously up to 3000 psi working pressure, it operates up to 5000 psi at 10 percent of the time duty cycle with overall efficiency of 85 percent without supercharging.

The unique "Pendulum Action" employs only a minimum of moving parts. The slipper and plunger in the pump are connected by a special cylindrical socket type joint. As the eccentric shaft revolves, the slipper moves back and forth along the shaft's contour like the pendulum of a clock. The plunger moves with a straight line action, and the load developed by pressure on top of each plunger acts along the same straight line.

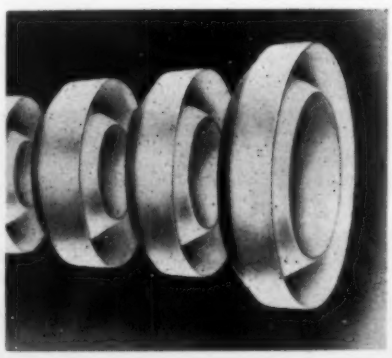
Circle 106 on Reader Service Card

LARGE DIAMETER CYLINDERS — Completely redesigned, and available in a wide range of mounting styles, new 14 and 16 in. low pressure cylinders for 125 psi air, or 160 psi hydraulic, are introduced by Hannifin Corporation. Cup type pistons and chevron-type gland packings make the new cylinders suitable for air, oil, or water service. Users' design problems are simplified by the fact that the compact, rugged end caps are furnished to the same mounting dimensions either cushioned or non-cushioned. Two large pipe ports are drilled in each cap — 1 in. in the 14 in., bore size, 1¼ in. in the 16 in. size. Double-end rods are available in most mounting styles. The 16 in. cylinder will exert a force of ten tons on a push stroke at 100 psi.



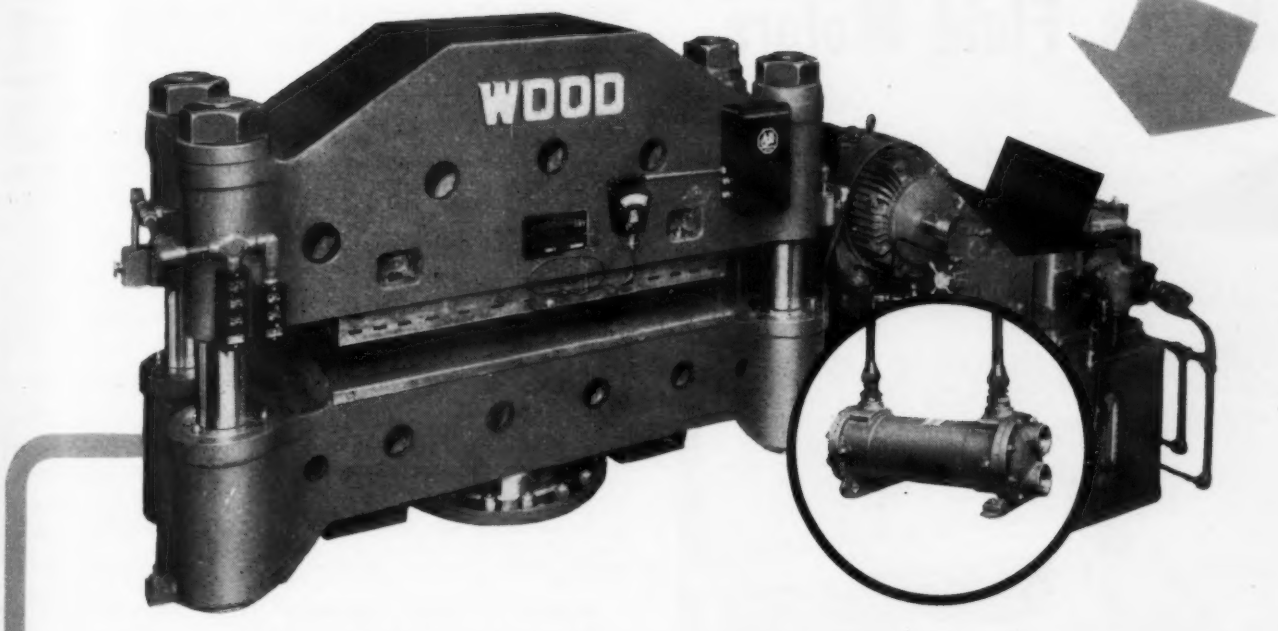
Circle 107 on Reader Service Card

FRICTIONLESS "V" RINGS — Crane Packing Company offers "V" Ring type packings molded from pure Teflon. This development is the newest in the growing line of "Chemlon" (Teflon - fabricated) packings made by the company. Molded by a specially developed process, these "V" type packings combine the chemically inert and frictionless properties of Teflon with the resilience and toughness needed for proper sealing results. A special cross-section design insures permanent sealing,even under varying pressures, at temperatures up to 450 F.



Circle 108 on Reader Service Card

DO Your HYDRAULIC PRESSES OFFER THIS SAFEGUARD AGAINST EXCESSIVE OIL TEMPERATURES?



Embossing leather and simulated leather is the full-time job of this 500-ton, 4-column, single opening Wood Hydraulic Press. Fully automatic and operating at a max. speed of 12 cycles per minute, it receives its hydraulic power from a radial piston pump having a displacement of 23.8 gpm at 2,730 psi pressure.

Precise timing (sheet material is fed by a synchronized mechanism) and high production pace — two of this press' greatest assets — allow no room for failing pump capacity or seizure of vital, close clearance parts. And R. D. Wood Co. leaves no such room! Attached to the power unit (inset at right) is a Ross Type BCF Exchanger . . . Wood's way of assuring its customers that this press, and others in the diversified Wood line, are protected against pump slippage, internal leakage, malfunction of precision parts, accelerated breakdown of vital oil properties . . . the penalties apt to be paid for allowing hydraulic fluid to reach excessive temperatures.

And like other leaders in the primary equipment field, Wood selects compact, all-copper and copper alloy Ross BCFs for a number of important reasons . . . not least among them, the fact that they are fully standardized at lower cost and stocked for prompt shipment.

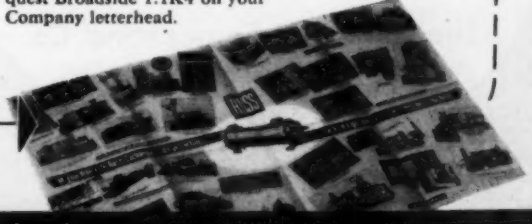
ROSS HEATER & MFG. CO., INC.
Division of American Radiator & Standard Sanitary Corporation
1464 West Ave. **Buffalo 13, N. Y.**
In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

ROSS

type BCF EXCHANGERS

★ NEW BROADSIDE FOR HYDRAULIC EQUIPMENT MAKERS AND USERS

If you have *anything* to do with hydraulic equipment, you'll benefit from the information in this profusely illustrated broadside. See how the "BCF" is used profitably in a tremendous variety and number of hydraulic machinery applications. Merely request Broadside 1.1K4 on your Company letterhead.



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The DENISON Engineering Co.
1166 Dublin Rd., Columbus 16, Ohio

DENISON HydrOILics

Pneumatic Loading In The Textile Field

(Concluded from page 21)

chine. A pneumatic loading system, with its precise control of the air pressure, gives an immediate and accurate change in percent of pick-up to satisfy an exact requirement. Or, for example, both rolls of a machine have to be driven, usually the top roll is driven from the bottom roll. In such cases, extra pressure must be applied to the top roll on the drive side (to compensate for the force applied to make the roll turn). This is easily accomplished by a pneumatic loading system which can provide separate pressure control for the ends of the roll.

Major Applications of Pneumatic Loading

1. Squeeze roll extractors before drying
2. Size box squeeze rolls for slashing textile yarns
3. Padding squeeze rolls for dyes, starch, resins and acids
4. Intermediate squeezes for wash boxes, scouring machines, mangles
5. Calendering and other special applications

Rubber covered squeeze rolls should not be left with the load applied when the machine is not operating, since the roll is liable to "flat" very quickly. With mechancial or other means of loading, it may be a long and difficult matter to raise all the rolls every time a machine stops. However, with pneumatic loading, the simple flip of one air switch on the control panel (or by a solenoid operated valve) all the rolls can be raised immediately.

Air Cushioning Effect

The cushioning effect of the loading, under pneumatic control, is an outstanding characteristic, especially when seams, knots or hard objects of any kind pass through a set of squeeze rolls. When the rolls are under "locked-in" pressure, serious damages may result. Pneumatically loaded rolls are able to "give" and allow irregularities to pass through the nip.

In the sizing of warp yarns, the roll pressure is usually restrained to avoid flattening of the yarn and to prevent too much size penetration into the fibres. Exactly the correct pressure is applied by means of a pneumatic loading system, even less than roll dead weight, if desired. Often the top roll is lapped with a blanket and each time the lap comes to the nip of the rolls an extra amount of size may be left on the yarn. Pneumatic cushioning corrects this condition, there is no excess of size at this point. In addition to a more usable and uniform product for the weaver, a substantial increase in production is obtained.

HERE'S HOW

(Concluded from page 23)

draulics published their standards to include paragraph H6.3-5 which reads: "Pistons utilizing sealing devices which are not integral with the piston shall have automotive step cut rings or equivalent in performance. Exceptions are permissable only for applications where no leakage (other than required for lubrication) can be tolerated."

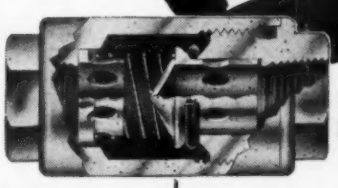
This has resulted in repeated calls for automotive step cut rings which have been obsolete for twenty years. All rings regularly available in the automotive size range of 2½ to 5-inches bore size are straight or butt type joints. In the larger sizes some rings are regularly stocked having 45° diagonal joints. These are made on fixtures not yet worn to justify replacement and can be used interchangeably with butt joint rings. Since step joint rings offer no better seal, they are for the large part no longer made. It is obvious that step joint rings have a leakage path equal to straight joint rings through the clearance behind the ring. In this connection, it would be well to mention that the leakage path is enlarged at the ring gap by chamfering the corners of the ring lands, and they should be deburred only.

End clearance in any cylinder is for the purpose of accommodating the difference in change in bore and ring size with change in temperature during operation. In hydraulic cylinders this temperature change is quite small and a minimum end clearance of .002 or .003 in the smallest part of the bore is satisfactory. Theoretically the minimum end clearance of a 45° diagonal joint is .707 times that for a butt joint, but the same value can be used for both. A .010 tolerance is common on this type and size range for end clearance.

Now!

A CHECK VALVE

that will not leak



The CIRCLE SEAL floats between conical surfaces... seals bubble tight.

CIRCLE SEAL check valves guarantee you

absolute sealing
minimum resistance to flow
maintenance-free dependability
quiet, chatter-free operation

CIRCLE SEAL Check Valves are designed for standard and very low pressure service . . . for all types of hydraulic and pneumatic systems.

If you have a Check Valve problem CIRCLE SEAL can solve it. Ask for complete information . . . write today.

CIRCLE SEAL

Check Valves

JAMES-POND-CLARK
1247 EAST GREEN ST., PASADENA 1, CAL.

CIRCLE SEAL DATA

Furnished as follows: ⅛", ¼", ⅜", ½", ¾" and 1" NPT.
(other connections or sizes can be furnished to order)

WORKING PRESSURES

Standard Type

Range: 0—3000 psi
Opening: From 1 psi up (as required)
Closing: 0 psi (poppet closes before start of return flow)

Low Pressure Type

Range: 0—1 psi
Opening: 4"-8" water column
Closing: 0 psi (poppet closes before start of return flow)

FLUIDS

Air, gas, water, salt water, crude and refined petroleum products, etc.

Metallic and non-metallic parts can be provided to withstand the action of nearly all commonly used industrial fluids.

TEMPERATURES

—65° F to 280° F (valves suitable for temperatures up to 500° can be furnished to order)

Circle 21 on Reader Service Card

A POSITIVE SEAL AT ALL ALTITUDES...EVEN AT –65°F!

with

LINEAR PACKINGS

The W. H. Nichols Company required special seals, of utmost dependability, for two rather unusual jobs in this pump. LINEAR "Perfectly Engineered Packings" filled the bill and are giving A-1 performance in a critical operation.

The unit includes one oil pressure pump and five scavenge pumps . . . is used on turbojet engines for lubricating and cooling main shaft bearings and gearbox. Two LINEAR "O" Rings seal the joint between the two sections of the pump housing and further prevent the transfer of fluid from the discharge side of the pump . . . two LINEAR "U" Cups keep the oil in and the air out. They must withstand a variety of temperatures from —65° to +160°F. and pressures ranging from sea level up to 45,000 feet.

Meeting such sealing needs is not uncommon with LINEAR. Thousands of products throughout industry are effectively and efficiently using economical, versatile, precision moulded LINEAR "O" Rings and "U" Cups . . . for a host of sealing applications.

In addition to these successful homogeneous rings, seals of fabric reinforced materials, fluoroethylene polymers, silastics and special synthetic rubbers are available to meet specific requirements.

For individualized attention to your packing problem, design or application, CALL LINEAR!

"PERFECTLY ENGINEERED PACKINGS"

LINEAR

LINEAR, Inc., STATE ROAD & LEVICK ST., PHILADELPHIA 35, PA.

Circle 22 on Reader Service Card

Useful Catalogs and Bulletins

available for reference

Power Equipment

High Pressure Pumps . . . New Aldrich Data Sheet 64-B describes the recently designed Aldrich 5 in. stroke multiplex direct flow pumps. This 6 page bulletin covers design advantages, construction, specifications and drive requirements. Also included are: a pump selection chart; dimensional drawings; plunger pressure and capacity data on both the 5 and 7 plunger units. The capacity range of these two pumps, in bbl. per day at 100 rpm, is from 292 up to 5060 bbl. Maximum pressures range from 614 psi with 3½ in. diameter plungers to 7500 psi with 1 in. diameter plungers.

Circle 113 on Reader Service Card

Hydraulic Cylinders . . . Hanna Engineering Works has just completed a new catalog No. 233-A. This 28 page booklet includes illustrations, specifications, design, construction and operation features, and suggestions for uses of high pressure hydraulic cylinders. Cylinders are available for every mounting requirement, for hundreds of applications where a controlled push, pull, lift, press or clamp is desired, and for working pressures up to 1500 psi.

Circle 114 on Reader Service Card

Air Powered Wrench . . . With the publication of Bulletin 215, The Cushman Chuck Company provides descriptive and technical data on the new Cushman Power Wrench and control equipment now available for application to single spindle machine tools. With this type of equipment the advantages of power chuck operation become available to a much wider range of users and at a competitively low investment cost. Design of units is such that normal, tooling is not interfered with and the operator retains full view of his work with all controls in normal.

Circle 115 on Reader Service Card

Centrifugal Pumps . . . Design and construction features of a close-coupled pump and motor, the Electrifugal, are described in a new bulletin released by Allis-Chalmers Manufacturing Company. The pump has a single shaft mounted in a unit-cast frame to assure perfect and permanent alignment. The pump is available with drip-proof, splash-proof, totally-enclosed, fan-cooled or explosion-proof motor enclosures. Some sizes can be had with removable casing, others with removable cover plate.

The pumps are available in ratings from 10 to 500 gpm at heads to 220 feet. Motors are rated from ¾ to 10 horsepower.

Circle 116 on Reader Service Card

High Pressure Equipment . . . The range is 5000 to 20,000 psi! Harwood Engineering Co. presents a 27 page catalog describing equipment for the production, utilization and measurement of pressures in this range. Double acting intensifier circuits for both industrial and laboratory applications are illustrated. Fittings, control valves, tubing and instrumentation to meet pressure requirements are described.

Circle 117 on Reader Service Card

Hydraulic Power Units . . . Logansport Machine Co., Inc. has just issued Catalog No. 200 Section 1 which describes models 6031 and 5022. Mechanical and operating features are included along with an application circuit.

Model 5022 includes an accumulator. This unit has been developed to meet the requirements of a self-contained power unit capable of supplying, intermittently, oil under pressure for the operation of cylinders, chucks, clamping units and various other devices where a constant pressure, but not a continuous flow of oil, is required.

Circle 118 on Reader Service Card

Hydraulic Transmission . . . Wegner Machinery Corp. has issued catalog sheets describing their variable speed transmission. Designed to meet the needs of variable speed requirements where constant torque applies, the transmission consists of a variable displacement pump directly ported to a constant displacement hydraulic motor. The motor output speed is controlled by varying the pump displacement from zero to 1200 rpm in either direction. Normal running torque is 63 inch lbs. Starting torque is 100 inch lbs.

Circle 119 on Reader Service Card

High Pressure Pumping Units . . . The complete Denison pumping unit for service up to 5000 psi is illustrated in Bulletin PU-4. Twenty-two models are offered to meet a wide range of requirements. The base of the unit is the reservoir. All operating components are mounted to the removable top cover, including electric motor, pump, relief valve and gauges. The range of units provide capacities from 7 gpm to 35 gpm.

Circle 120 on Reader Service Card

Fluid Pressure Boosters . . . When to use boosters in place of air cylinders, when to use them in place of hydraulic pumps, how they operate to produce practically any desired hydraulic output pressure up to 10,000 psi from ordinary plant air or hydraulic pressure, how to select the proper size, model and type of booster best suited for a particular application are all fully covered in Miller Motor Company's new 12 page Bulletin B-200. Included are detailed descriptions of single acting and double acting boosters in single and dual pressure circuits.

Circuit diagrams, simplified formulae for calculating boosters, illustrations and descriptions of actual models available, together with mounting and dimensional data and a handy, time--saving booster "Selector Chart" are also given.

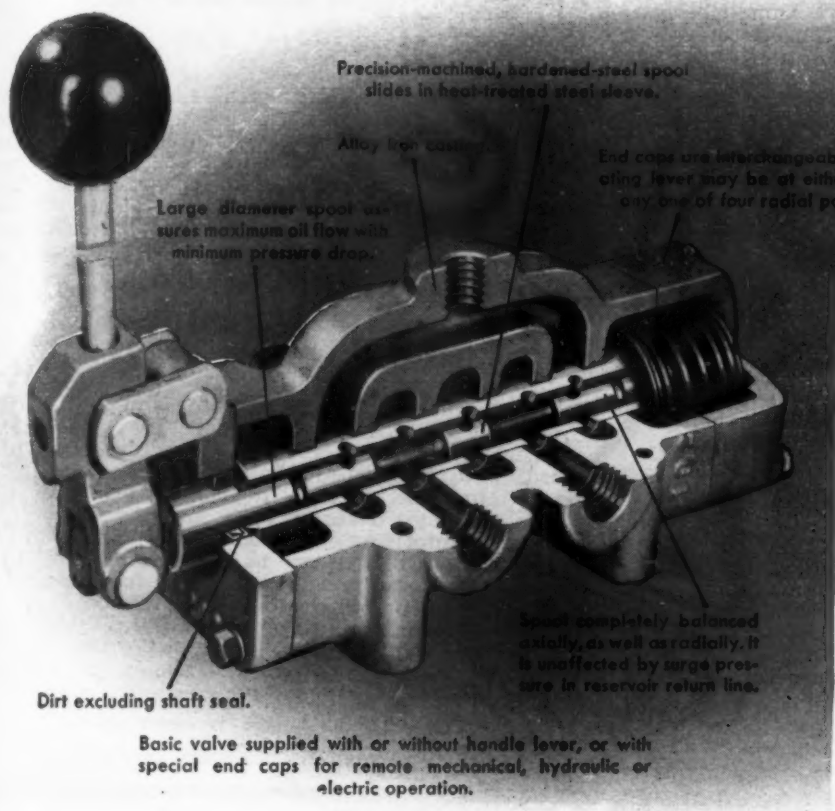
Circle 121 on Reader Service Card

Air Operated Hydraulic Power Unit . . . Capable of providing output fluid pressures to 30,000 psi from 100 psi plant air supply, the power unit, developed by Sprague Engineering and Sales, is a completely self contained unit. These small, versatile units which may be mounted in a space approximately 19 x 14 in. are described in an available catalog sheet. Standard models are for oil service. Other models are available for corrosive liquids.

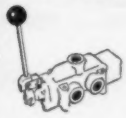
Circle 122 on Reader Service Card

THE *Under-Cover Features* OF THE

New Adel Hydraulic Selector Valve


Precision-machined, hardened-steel spool slides in heat-treated steel sleeve.
Alloy iron casting.
End caps are interchangeable. Operating lever may be at either end at any one of four radial positions.
Large diameter spool assures maximum oil flow with minimum pressure drop.
Spool completely balanced axially, as well as radially, it is unaffected by surge pressure in reservoir return line.
Dirt excluding shaft seal.
Basic valve supplied with or without handle lever, or with special end caps for remote mechanical, hydraulic or electric operation.

ADEL OFFERS 4-WAY VALVES IN A VARIETY OF MODELS TO MEET ALL OPERATING CONDITIONS


Lever Operated 4-Way Valve For Manual Control

Mechanically-Operated, 4-Way Valve For Remote Manual Control

Pilot-Operated 4-Way Valve For Remote Hydraulic Control

Single Treadle 4-Way Valve For Foot Control

6, 12 or 24 Volt DC Solenoid-Operated 4-Way Valve For Remote Electrical Control

110 AC Solenoid-Operated 4-Way Valve For Remote Electrical Control

Cam-Roller Operated 4-Way Valve For Automatic Control

Unlimited flexibility...quiet, shockless operation ...low pressure drop...long, dependable service! These are the operating characteristics of the new ADEL line of hydraulic oil control valves. Simple, spool-type construction permits wide variety of porting arrangements for either open-center or closed-center hydraulic systems. Standard 4-way valves available with spring-centered, spring-offset, or three position detent action. Manufactured in ¼", ⅜", ½", ¾" and 1" pipe thread port sizes for 1000 psi service. Flows to 32 gpm.

Write for new, descriptive bulletin containing detailed information on ADEL's line of industrial hydraulic equipment. Please address inquiries to 10755 Van Owen Street, Burbank, California.

ADEL

ADEL PRECISION PRODUCTS CORP.

BURBANK, CALIF.

A FEW SELECT TERRITORIES ARE STILL AVAILABLE TO PROGRESSIVE DISTRIBUTORS OF HYDRAULIC EQUIPMENT - INQUIRIES INVITED

Control Equipment

Solenoid Operated Valves . . . Automatic Switch Company has completed the printing of a 72 page Valve Catalog 23 describing the extensive line of ASCO Solenoid Operated Valves, so widely used for automatically controlling the flow of liquids and gases. It is well illustrated and documented with engineering tables. Contents are spirally bound in a heavy permanent cover. The catalog consists of 10 sections covering general information, selection tables and terms; flow charts; safety shut-off and manually reset valves; packless and packed solenoid valves; 3-way solenoid valves; 2-and 3-way pilot controlled solenoid valves; 4-way solenoid valves, and filters and strainers.

Circle 123 on Reader Service Card

Pressure Switch . . . Data is available from United Electric Controls Co. describing the Type P pressure and vacuum control for use in liquid level devices and for the control of air and gas pressures. The pressure control incorporates a snap-action switch with heavy silver contacts good for millions of makes and breaks, and a seamless bellows, which is extremely sensitive to pressure changes. The bellows being heavily spring loaded, reacts instantly upon a change of pressure.

Circle 124 on Reader Service Card

Overcurrent Relay . . . Westinghouse Electric Corporation has prepared a catalog sheet announcing a new type CO-10 overcurrent relay. The relay can frequently be used to advantage where a long-time delay is required for light overloads. The burden is extremely low. Approximately .3 volt-amperes at tap values of current.

Circle 125 on Reader Service Card

Oil Control Devices . . . Just published by Hydraulic Equipment Company, is an interesting folder on HYDRECO gear pumps, control valves, auxiliary valves, cylinder assemblies and pump-valve-tank combinations. Typical delivery data on pumps, capacity ranges on valves, operating pressures, and other such vital data are given. This folder should be of considerable interest to users of hydraulic equipment.

Circle 126 on Reader Service Card

Magnetic Clutch . . . Bulletin 60-1, released by Vickers Electric Division, presents charted data on magneclutch performance. Five general classes of service are discussed. The clutch features a large maximum to minimum torque rating; full torque at zero slip; virtually no wear on torque transmitting surfaces; fast response and flat torque-speed characteristics.

Circle 127 on Reader Service Card

Materials and Services

Design Templates . . . Design work which includes air or hydraulic cylinders can be greatly simplified and considerable time can be saved if templates are used, according to Ortman-Miller Machine Co., Inc. With that in mind, the company now offers a complete set of such templates covering their line of cylinders.

The set, comprising eight sheets and printed on both sides, is drawn to both one-half and full scales. Plan, front elevation and end elevation are included on all cylinders from one inch to eight inch bores and a full range of interchangeable mounting devices is shown. The templates are slipped in position beneath the designer's tracing paper or cloth and the required component parts are traced off.

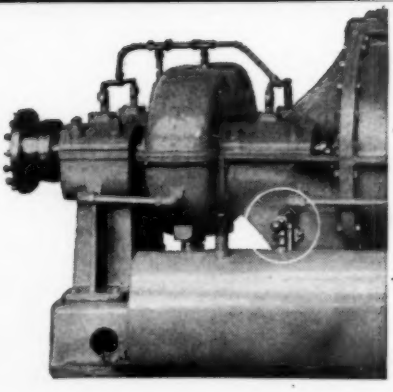
Circle 128 on Reader Service Card

For

BEST PRODUCTION

You Need

BEST EQUIPMENT



ROOTS-CONNERSVILLE BLOWER CORPORATION
CONNERSVILLE, IND. *INSTALLS*

OIL-RELIEF FULFLO BY-PASS VALVES

THIS outstanding manufacturer incorporates FULFLO VALVES shown directly above the tank or oil reservoir in the efficient R-C Rotary Positive Gas Pumps.

FULFLO VALVES maintain constant, uniform pressures . . . NO MAINTENANCE . . . and they're CHATTERLESS because of the manner in which the cylindrical piston closes off the port.

Pipe sizes: ¼" to 2" standard pipe thread and STD 300 lb. American flange valves 1" to 1½".

TRADE MARK FULFLO REG. U.S. PAT. OFF.

Specialties Co., Inc.
BLANCHESTER, OHIO

Write TODAY on your letterhead for FULFLO MECHANICAL DATA BOOK

Lubricant . . . Lubricant suitability to meet your needs is emphasized in Fiske Brothers Refining Co. 43 page Lubriplate Data Book. Lubrication recommendations for components in a variety of industries from air conditioning and automotive to sugar and textiles are presented. Grease and oil selections are made for specific applications in each industry.

Circle 129 on Reader Service Card

System Accessories

Oil Seals . . . Well illustrated with application pictures of the Clipper Seal, Johns-Manville's 15 page catalog provides valuable information for the user of oil seals. The Clipper Seal consists of a one piece moulded body, which is the seal, and a garter spring. It has no metal case, permitting greater freedom in design and simplifies installation problems. Step by step assembly procedure is described.

Circle 130 on Reader Service Card

Dynamometer . . . Applications of Dillon dynamometer, used for measuring traction, tension or weight are illustrated in Bulletin D1. This instrument is available with 5 or 10 in. dia. dials and twelve different capacities up to 50,000 pounds. Being portable and direct reading the dynamometer finds wide use as a field test instrument and as a testing device on long bulky materials which can not be tested with conventional laboratory instruments.

Circle 131 on Reader Service Card

Rotary Shaft Seal . . . Repsco rotary shaft seals are described by the Republic Supply Company in an 8 page catalog. This seal is a positive mechanical seal suitable for a wide range of pressures and temperatures to 350 F. An exploded view shows the simple construction of this rotary seal. "O" rings are used as the sealing member.

Circle 132 on Reader Service Card

Central Oil System . . . Bulletin 802, released by Lincoln Engineering Company illustrates their Cetr-Oiler lubrication system. The system consists of a central hand pump supplying lubricant throuugh a single line circuit of injectors which in turn deliver a predetermined, measured quantity of oil to each bearing every time the system is cycled. A full range of accessories for connecting to rotating or reciprocating bearings are available. Cross-section drawings tell the injector cycle story.

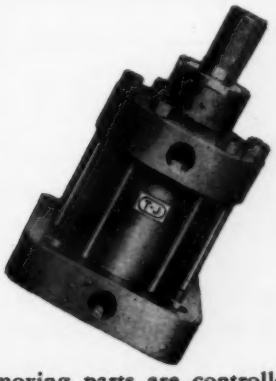
Circle 133 on Reader Service Card

Unions and Valves . . . Catalog 11 is the general release for Catawissa standard and double extra heavy hot forged steel unions as well as their orifice, male and female, lug nut, and full stainless steel and full alloy steel unions. This 20 page catalog is amply illustrated with cross-sectional drawings and test data curves.

Circle 134 on Reader Service Card

Air Line Components . . . To aid in clarifying the problems of small volume air pressure regulation, Conoflow Corporation has released a new Technical Bulletin titled "Performance Characteristics". Identified as Bulletin 105, this four-page engineering paper defines the basic differences between flowing service and dead end regulation and presents suggested tests, capacity charts and other data to illustrate these statements. Using a question and answer presentation, air regulator operation and the combination reducing valve and filter are clearly described.

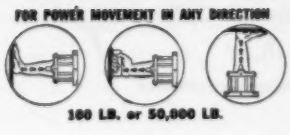
Circle 135 on Reader Service Card



All moving parts are controlled hydraulically by T-J Cylinders—on this Malleable Nut Production Machine designed and built by Roy Hays & Associates, Rockford, Ill., for the Wagner Malleable Products Co., Decatur, Ill.

It's *fully automatic*—the operator only places nuts in stations. Nine T-J Cylinders, 40 ton to ½ ton, help complete the job of cutting off sprue, sizing, boring, facing, chamfering and threading 2,500-¾ std. pipe thread nuts per hour.

For your tough jobs of power movement—pushing, pulling or lifting—*save labor, speed production* and *cut costs* with T-J Air and Hydraulic Cylinders! Many standard sizes and styles . . . both cushioned and non-cushioned types . . . 100 lb. or 50,000 lb. Precision-built for long-life dependability. Write for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.



T-J
TOMKINS-JOHNSON
RIVITORS . . AIR AND HYDRAULIC CYLINDERS . . CUTTERS . . CLINCHORS

33 YEARS EXPERIENCE

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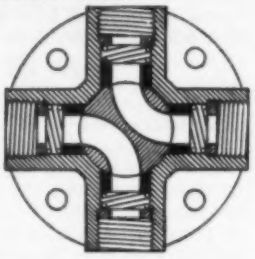
Circle 27 on Reader Service Card

New

"ARDEE" VALVES

HAVE



MOLDED TUBULAR SEALS

These new inexpensive manual 4-way valves control 150 psi air pressure, and handle liquid pressures up to 750 psi. Available in pipe sizes from ¼" to ¾". A tubular sealing member slides over the cylindrical surface of the rotor, maintaining intimate contact during operation of the valve. Pipe scale and foreign material in the line cannot lodge between the sealing surfaces, due to the wiping action of the sliding seal.

Valve bodies, depending on service, are furnished in aluminum or brass, and the tubular sealing members are molded of various resilient materials suitable to the service requirements. The controlled degree of softness assures a tight seal against the curvature of the mating surface. There is minimum pressure loss through the valve because the direct, circular section flow passages are unobstructed and of approximately the same diameter as the nominal pipe size. The non-interflow characteristic of the ARDEE valves is important for operations where variable throttling is desirable.

BARKSDALE

4905 SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA

Circle 28 on Reader Service Card

Gre-Sen--the High Quality Hydraulic Control Valve at the Mass Production Price

WILL SOLVE YOUR VALVE PROBLEMS

Check These Superior Features

- Fully Balanced
- Spring Loaded
- Self Centering
- Easy Control
- Precision Built
- Built-in Relief Valve

GRE-SEN HAS BANK VALVE FEATURES

GRE-SEN Control Valves are designed for use as single units or in multiples in any combination desired. Mass production on this better engineered, popular valve gives you improtant savings in your valve costs.

Model No. 300 is for operating single acting cylinders. Model No. 400 (shown above) is for operating double acting cylinders. Capacity 16 GPM; pressure up to 1,250 PSI.

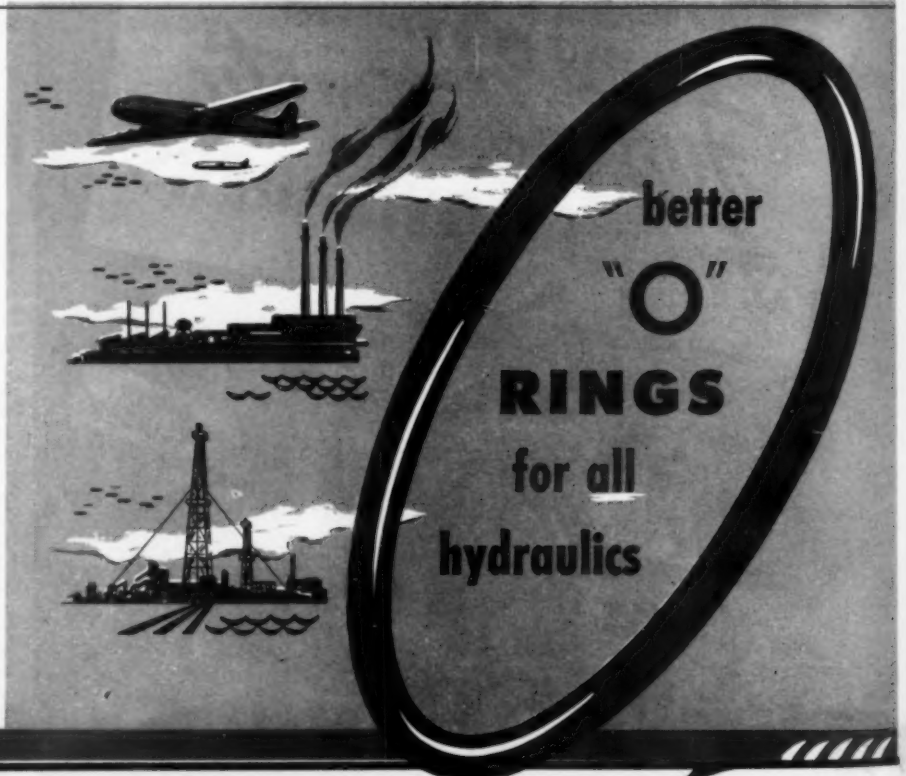
Write for full facts about this better built, money saving valve.

GRE-SEN Manufacturing Company

Dept. A-110, 628 Colfax Avenue North, Minneapolis 11, Minn.

"Parco" is a trade name to rely on for better "O" rings. Better because the material used is precision compounded and fabricated by men with years of experience. All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-P-5510 (6290) are available from stock. Silastics, Kel-F, and other special compounds are available on order.

Catalog and engineering data on request. Write us today.



Parco

Plastic and Rubber Products Company

2100 Hyde Park Blvd., Los Angeles 47, Calif.

919 No. Michigan Ave., Chicago, Ill.

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Applied Hydraulics Book Shelf

Industrial Instrumentation

Donald P. Eckman, *396 pages, published by John Wiley & Sons, Inc., at $5.00.*

Methods for measuring flow, pressure and temperature are thoroughly presented here. Operation principles and circuit installations are described using schematic diagrams and illustrations. Primary emphasis is given to the method rather than to the mechanism, making the book of definite value to men who must apply the instrumentation.

Instruments for mechanical measurements such as displacement gages, strain gages, force meters, velocimeters and accelerometers are discussed. Methods of applying instrumentation to processes are presented with the arrangement and selection of instruments and controllers, process analysis and supervision of instrument equipment.

P.R.

Kent's Mechanical Engineers' Handbook Design and Production Volume

Colin Carmichael, *Editor, Twelve Edition, 1611 pages, Published by John Wiley & Sons, Inc., at $8.50.*

This volume is of particular interest to the hydraulic engineer who is concerned with the development and manufacture of machine tools and special purpose equipment in the many fields which oil power is so important. Much of the data on materials, machine elements and production processes has been rewritten and expanded.

New sections include a chapter on machine hydraulics which describes the various hydraulic principles and power and control components. Also covered for the first time are servomechanisms, industrial electronic control, statistical quality control, surface finish, plastics and plastic molding, powder metallurgy, shot peening, brazing and precision investment casting.

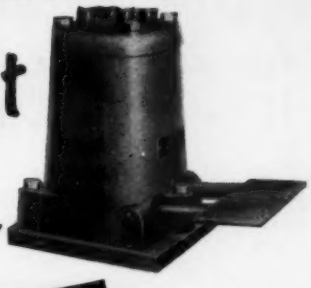
Torque Converters or Transmissions

P. M. Heldt, *Third Edition, 438 pages, 5 x 8¼ inches. Published by P. M. Heldt, Nyack 9, N. Y., at $6.00.*

This standard treatise on the major types of clutches, couplings, transmissions and torque converters is the first reference book any engineer whose work is in this field should have within reach. The third edition has been completely revised, new materials, especially in the chapters on hydro-kinetic torque converters and automatic stepped transmissions, has been added. The difficult job of providing a proper balance of basic

Circle 46 on Reader Service Card

Increase output of shears, presses, hammers, etc. with Quick-As-Wink foot-operated air valves

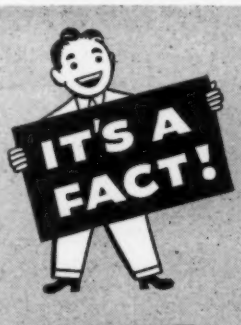


● Operators have both hands free to handle the work. Valving mechanism has stainless steel body, brass sleeves, and many other refinements that assure long, trouble-free operation, and minimum wear. All operating parts are fully enclosed. Balanced construction prevents creeping. No metal to metal seating. Thousands of satisfied users. ¼" to 1" sizes. For air to 125 p.s.i. *Write for full details today!*

Quick-As-Wink AIR AND HYDRAULIC Control Valves

THE HIGHER THE PRESSURE THE TIGHTER THE SEATING

Mfd. by C. B. HUNT & SON, INC., 1967 E. Pershing St., Salem, Ohio



HIGHEST QUALITY BRONZE PARTS FOR ALL TYPES OF PUMPS AT ATTRACTIVE SAVINGS

The result of American Crucible know-how and equipment.

PROMET THE Engineered BRONZE

thrust plates, bearing plates, pressure plates, bushings, seals and connecting rods, machined or rough cast, of the specific formula best suited to each application, carry a

MONEY-BACK GUARANTEE OF LONGER SERVICE

Some of America's largest pump manufacturers rely on Promet.

Write for literature. Let us make recommendations and quote you. Simply send blueprints, conditions of operation and other data. Our engineering department will be glad to counsel with you.

THE AMERICAN CRUCIBLE PRODUCTS COMPANY

1303 Oberlin Ave. Lorain, Ohio

Circle 47 on Reader Service Card

Circle 29 on Reader Service Card

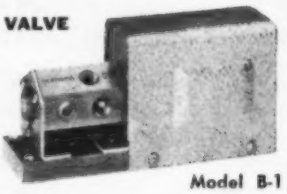
Now, PRECISION CONTROL
for ALL Air Operations . .
HY-CYCLIC AIR VALVES

NEW Hi-Cyclic Air Valves fill the need for a *fast, accurate smooth* control for air power. Hi-Cyclic Valves function as ordinary operating valves; control air cylinder stroke to .001"; reciprocate mechanically or electrically; control pressure in both ends of the cylinder; stop and return the stroke at any point without overtravel; control stroke speed in either direction; operate on any airline pressure as well as 1" of vacuum; consume air in *direct ratio* to work done.

Investigate the revolutionary Hi-Cyclic Valve. Write for details and recommendations.

HI-CYCLIC SINGLE SOLENOID VALVE

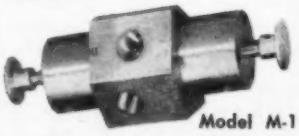
Instantaneous operation. Suitable for conventional and fast operations up to 700 cycles per min. Readily adapted to hand, foot or knee switch control. Available as 3, 4, or 5-way valve in ⅛", ¼" and ⅜" ports.



Model B-1

PILOTED MASTER HI-CYCLIC VALVE

Hand controlled or remote piloted by Model B-⅛" valve. Available in 3, 4 and 5 ports, ⅜". For high speed and extreme accuracy, this valve can operate on oil and be piloted by air.



Model M-1

Bulletin 10 describes Hi-Cyclic Basic Valves; Single and Double Solenoid Valves; Heavy Duty Piloted Valves; Hydraulic Valves. Write for your free copy.

BECKETT-HARCUM CO., 1145 Wayne Rd., Wilmington, O.

SAVE UP TO 85% in WAR SURPLUS HYDRAULICS

SPECIAL BARGAIN #29 HYDRAULIC CYLINDER

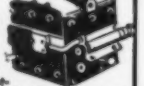
Gives 20,000 lbs. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lbs. thrust with 3,000 lbs. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1⅝" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road farm and shop machinery, presses, etc. Cost Government $390.00 . . . . . NOW 22.50

HYDRAULIC CYLINDERS

NO. 3A – Bore 1½", Shaft ¾" Stroke 9", Length 10½" 5.75

NO. 9E – Bore 1-3/8", Shaft 1" Stroke 15-5/8", Length 15⅛" 8.50

NO. 35 – Bore 1½", Shaft 1" Stroke 26", Length 23½" 12.75



HYDRAULIC TRANSMISSION Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever,) supplying piston hydraulic motor. Automatic pressure. Dash pot for smooth control. Power output R.P.M. – 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicater Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. Includes 2 - 4" Spline Shafts for input and power take-off. Cost Government approx. $400.00 27.50

HAND PUMP

Provides an instantaneous source of tremendous power for almost any heavy work. Double action stroke. Delivers .30 cu.in. per cycle at 3000 PSI. Maximum pressure 5000 PSI. Has built-in reservoir with 2½ qts. capacity. 3/8" pipe outlets and pressure release valve. Base is 7¾" diameter. Pump is 23 3/16" overall height. Weight 15.2 lbs. A $40.00 Value 15.95 Used-in good Condition 11.95

HYDRAULIC PUMPS

ANGLE PUMP Positive displacement type, angle piston. Displaces .507 cu.in. per revolution. Has capacity of 6 gal. per minute at 3000 RPM at 1500 PSI continuous 1875 for 15 seconds. Operating speed of 3750 RPM, intermittent maximum 4500 RPM. Rotates to the right only. . . . . NEW 14.49

HP-3V-HAND PUMP

HP-3V-HAND PUMP – Operating pressure 2000 PSI. Capacity, 1.5 cu.in. per complete cycle. Has added feature of a diverter valve for selecting a suction & pressure port for two independent systems. . . . . ONLY 12.75

P-3 STRATO POWER PUMP With built-in variable flow control valve in head. Positive displacement piston type. Displaces .450 cu. in. per revolution. Two gal. per minute capacity at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous. 1400 PSI for 15 seconds. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotation either direction without adjustments. NEW 17.50

FOUR WAY VALVE

V-2B – Poppet Type. Off at neutral position. 3/8" AC Tube Ports – (9/16 - 20) thread. P.S.I. 1,500 . . . . . 4.75

V-17 – Poppet Type. Pressure balanced. Offset neutral position. Piston type with built-in relief valves for limit of cylinder strokes. ½" Standard pipe inlet & outlet ports. ½" AC tube to cylinder (¾" - 18) thread tapped ports. NEW 6.75

GEROTOR TYPE PUMP

Logan Gerotor type. For operating hyd. systems on tractors, trucks industrial machinery, etc. Delivers 8 GPM, at 1200 RPM, at 1000 PSI with 5 HP. Can also be used as Hydraulic Fluid Motor. Has 3/8" stnd. pipe ports, ½" splined shaft for pulley or direct attachment. 5½" dia. x 7" lg. Used but guaranteed condition. Now ONLY 17.50

We carry the World's Largest Supply of New Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes & Types. Can also supply all accessories such as Pumps, Fittings, Valves, Tanks, Hose Fittings. Let us solve your Hydraulic problems. Write for inform.

PALLEY SUPPLY COMPANY 6321 SAN FERNANDO RD. DEPT. AP-11 GLENDALE 1, CALIFORNIA

WRITE TODAY for 1950 TOOL CATALOG 72 PAGES of BARGAINS in Machine Tools (taps drills dies reamers, etc.) Hydraulic Cylinders, Valves, Pumps & Motors, Air Tools & Bearings

principles, distinctive design features and practical application and maintenance ideas has been well handled. Chapters on friction, over-running and automatic clutches, hydraulic and electric couplings, geared, planetary, hydrostatic, differential, inertia-type, variable-throw and pneumatic transmissions and the hydro-kinetic torque converter are included. A number of foreign designs, particularly British, are also shown.

The first two editions met with a very favorable response in both the automotive and the industrial fields. Particular interest was shown in the chapters on hydraulic couplings and hydrokinetic torque converters on which very little had been published previously. A total of 261 illustrations, including many reproductions of engineering drawings and charts of performance characteristics, add to the value of the book.

P.L.R.

Oil Filters

(Concluded from page 33)

quality of filtering. All three contaminants need not be removed all the time, they can be held down to reasonable concentration at moderate expense.

To do a proper job of applying a filter, the contamination to be removed must be evaluated. The relative proportions of abrasives, fibre and goo and the effect of each on the unit being protected must be known. Use a filter that will remove objectionable matter; forget those that are relatively harmless.

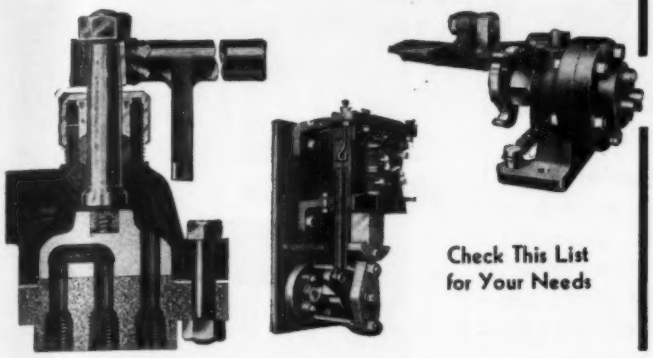
For best filter service, you must analyze:

1. The class of work
2. Operation characteristics of your equipment
3. Nature of contaminants expected under specific operations
4. Allowable limits of contaminants
5. General housekeeping or maintenance programs.
6. Initial operating and service costs.

The equipment must also be evaluated. In general, it does not pay to do any better degree of filtration than the removal of any particle which would become lodged in the smallest passage. As a rule, a maximum clear opening through the filter media one-half the size of the smallest machine clearance, approaches the economic balance between cost and degree of filtration. Practice has shown that a relatively coarse spaced filter will stop a lot of fine particles, particularly if the velocity is low.

The proper filter will save you money in repairs and down time. It will pay you to select the filter with the same thorough study used to choose the proper power and control components.

Circle 31 on Reader Service Card



Check This List for Your Needs

NICHOLSON AIR AND HYDRAULIC VALVES

Are in Use for Controlling These Types of Equipment:

Plastic Molding Presses
Sterilizers
Presses - Hoists
Cranes - Elevators
Gates - Dumps
Brakes - Clutches
Bus Doors
Locomotives
Larry Cars
Road Machinery
Large Gate Valves
Banbury Mixers
Watch Case Heaters
Vulcanizing Machines
Rimming Machines
Saw Cut-Offs
Open Hearth Furnaces
Mud Guns
Bell Valves
Molding Machines
Die Machines
Ore Tables
Automobile Lifts
Special Applications

Nicholson standard and special valves in lever, foot, solenoid, motor types; for air, gas, oil, steam, water ¼" to 2½"; press. to 5,000 lbs. CATALOG 546-A.

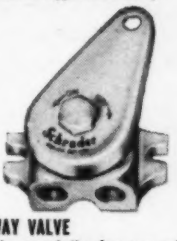
W. H. NICHOLSON & CO. 213 OREGON ST. WILKES-BARRE, PA.

TRAPS • CONTROL VALVES • STEAM SPECIALTIES

Circle 32 on Reader Service Card

POWERFUL, NEW, BANTAM-SIZE AIR CLAMPS

BASE MOUNTED TYPE SHOWN
(Leg Mounted Type Available)



NEW 3-WAY VALVE
Designed especially for use with above cylinders. Precision lapped stainless steel disc provide positive sealing action. Can be operated manually or mechanically.

Do you know what a tremendous saving in time and muscular effort can be made by using air clamps for holding work in position to be processed?

Here are the new Schrader bantam-size Air Clamps—they save space and pack all the power possible into the least dimensions. Piston and body are ruggedly constructed for long hard use. Body is of precision-machined cast brass—easily maintained. Two types of mountings, base or leg; six models in each type—strokes of 1 to 2 inches; cylinder diameters 1", 2¼" and 3".

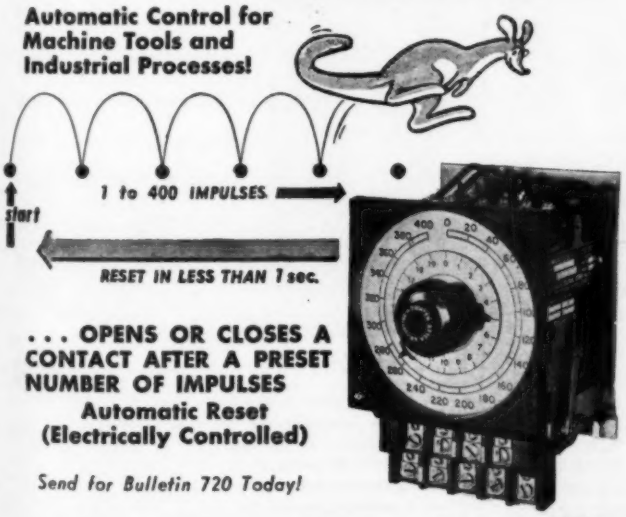
There's a Schrader Air Clamp for every application. Write for complete catalog data sheet today.

Schrader PRODUCTS CONTROL THE AIR

A. SCHRADER'S SON
470 VANDERBILT AVENUE
BROOKLYN 17, NEW YORK, DEPT-AH-1
Division of Scovill Manufacturing Company, Incorporated

Eagle MICROFLEX RESET COUNTER

Automatic Control for Machine Tools and Industrial Processes!



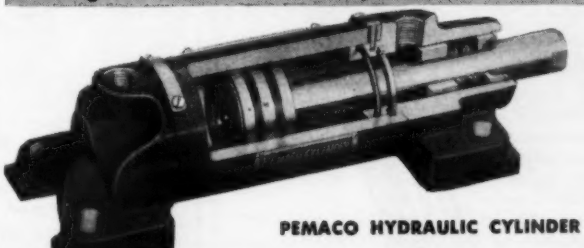
. . . OPENS OR CLOSES A CONTACT AFTER A PRESET NUMBER OF IMPULSES
Automatic Reset (Electrically Controlled)

Send for Bulletin 720 Today!

AN EAGLE TIMER FOR EVERY TIMING PROBLEM!

EAGLE SIGNAL CORPORATION Moline, Illinois

PEMACO HYDRAULIC AND AIR CYLINDERS
Designed to J.I.C. Hydraulic Standards



PEMACO HYDRAULIC CYLINDER

The reputation enjoyed by PEMACO for building first quality hydraulic and air cylinders was not acquired by chance. Sound engineering, modern design, the finest materials combined with years of experienced craftsmanship, has resulted in recognized acclaim throughout industry

Check these 11 points of superiority of the PEMACO HYDRAULIC CYLINDER:

- **"Heavy duty" hi-tensile cast iron castings (steel castings optional).**
- **Ample bronze bearing—oriented behind packing to reduce surge pressure.**
- **New type, low friction ram seal.**
- **"Seal guard" ram scraper gives positive packing protection.**
- **50 Rockwell — hardened and grounded steel ram — score resistant.**
- **Automotive type piston rings.**
- **"O" ring seals.**
- **Internal snap type keeper ring.**
- **Piston and ram positively secured by patented lock nut.**
- **Precision honed steel tubing.**
- **Designed to J.I.C. Hydraulic Standards.**

Write for complete information and engineering data.

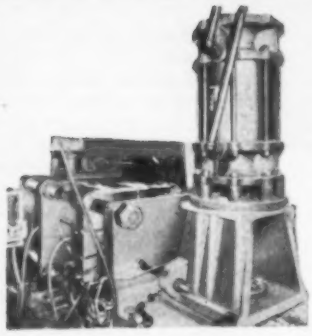
PETCH MANUFACTURING COMPANY
2769-71 HARPER ST.
MT. CLEMENS, MICH.

Circle 33 on Reader Service Card

Circle 39 on Reader Service Card

Ledeen cylinders improve the job

Ledeen Cylinders are Good Cylinders • Ledeen Cylinders are Good Cylinders • Ledeen Cylinders are Good Cylinders • Ledeen Cylinders are Good Cylinders •



CYLINDER SPEEDS DIE CAST PRODUCTION CYCLE

An increased rate of die cast production and a definite product improvement are made possible by the use of this standard 12" diam. x 8" stroke Ledeen *Super Duty* Cylinder, operating from plant air supply of 100 P.S.I.

Cylinder supplies injection power to force molten metal into the die. It replaces the usual screw-type injector, and gives faster, more positive injection improving castings and increasing production. Other similar, but smaller, casting machines employ Ledeen cylinders of 8" diam. x 6" stroke.

Standard Ledeen cylinders and mounting attachments are available from distributors' stock in major cities. Special cylinders on order.

Write for New Bulletin 500.

There are Ledeen *Medium Duty*, *Heavy Duty* and *Super Duty* cylinders for air, oil or water operation ready to help you, wherever you have to push or pull • lift or lower • press or squeeze • tilt or turn • open or close

Ledeen Mfg. Co.
1610 S. San Pedro St.
Los Angeles 15, Calif.

Circle 45 on Reader Service Card

Main-Ten-Ends

End 4. **Maintain a stock of spare hydraulic units and parts.**

Your lost production costs go up until you receive a replacement part. Dangers of mistakes on the order, lost shipments, or parts not being readily available increase your down time.

Savings in lost production often pay for your investment in inventory. It is good econocmy and good insurance to carry your own stock of replacement units and parts.

THE MARKET PLACE

Classified Advertising

FOR SALE

Pump Unit: new, unused, consisting of: Louis Allis, Frame 365, 20 hp double extension shaft, 1175 rpm, 220/440 v, 3 phase, 60 cycle electric motor; Superdraulic 6 PG-0650 radial piston constant delivery pump (7 gpm, 3500 psi max. pr.); Brown & Sharpe #55, V-104-D, vane pump (10 gpm); 1" relief valve, VR 500 (50-5000 Psi); ¾" relief, C-167-B (50-5000 psi); 1" check valve, VC-500 (5000 psi); ¾" check valve (250 psi); ¾" needle valve; Ross Mfg. Company Heat Exchanger #MB-CF-315 D-6 and 30 gallon tank arranged to mount the above items including oil filters, flexible couplings, valves, gauges, incidental piping, etc. *Power Unit:* new, unused, consisting of: two Superdraulic 6MC-2635 fluid motors; one Superdraulic #VF-5411-B1, 1¼" sol. control, pilot operated four-way valve; two 1¼" check valves, VC-500; one Greer Hydraulics, Inc. 2¼ gal. accummulator; one Greer 10 gal. accummulator; one Philadelphia Gear, Size 3708, Type S.B., 100 hp, 1200 rpm, 1:1 ratio miter gear box; one Philadelphia Herringbone drive, G-1 speed increaser unit, 112000 in., 4800 rpm out, 100 hp and sub base for the above units including lubricating pump, valves, gauges, flexible couplings, oil filters, incidental piping, etc. Address Box 11150, APPLIED HYDRAULICS.

SPEED PRODUCTION WITH
10-DAY DELIVERY
SPEED DESIGN WORK WITH
FREE TEMPLATES
SAVE SPACE WITH
O-M CYLINDERS

Ortman-Miller cylinders for air, hydraulic and water applications are available in the full range from 1½" to 8" bores on *ten-day delivery!* Add this to the other advantages of space saving and simplicity of design (no tie-rods, no bulky end caps).

All body parts machined steel (not cast), all bearing surfaces bronze. Circumferential keys allow disassembly and repacking in a matter of minutes, or interchangeable mounting brackets may be fitted without disassembly. Parts adjustable to any angle.

Write today for details and the services of your distributor.

And... write today for free complete set of templates in one-half and full scales. Precision drawn to save your time, speed design work. Shows all O-M cylinders and all mounting devices.

ORTMAN-MILLER
MACHINE CO., INC.
1204 150th Street, Hammond, Indiana

Circle 35 on Reader Service Card

Circle 36 on Reader Service Card

A *New* VALVAIR.. with HIGH TENSILE DIE-CAST BODY AT AN *Attractive Price!*

Two-way knob-operated Valvair air control valve with the new type die-cast body.

Preserving all the well-liked advantages of Valvair design: "O-U" type packer, parts interchangeable and replaceable, no metal seats, standard pipe area throughout valve, etc. For air, water and oil applications up to 175 p.s.i. and temperatures to 125° F. Sizes 1/4" and 3/8" only in knob-operated model only, 2-way and 3-way (open end exhaust).

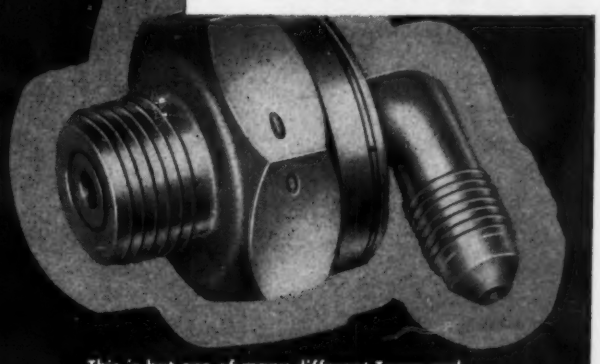
Write for prices and Bulletin "A".

VALVAIR CORPORATION • 454 Morgan Avenue, Akron 11, Ohio
AFFILIATE: SINCLAIR-COLLINS VALVE CO.

Rely Upon Valvair — 2-WAY — 3-WAY — 4-WAY

Circle 37 on Reader Service Card

CHIKSAN
HYDRAULIC SWIVEL JOINTS



This is but one of many different Types and Styles of CHIKSAN Hydraulic Swivel Joints for application on all hydraulic lines which must turn or swivel. Pressure capacities range from 1000 psi. to 3000 psi. Write for Bulletin A. Or tell us your requirements and CHIKSAN Engineers will gladly cooperate with you in developing Hydraulic Swivel Joints to meet your requirements.

CHIKSAN TRADE MARK REG.

CHIKSAN COMPANY
AND SUBSIDIARY COMPANIES
Chicago 3, Ill. BREA, CALIFORNIA Newark 2, N. J.
WELL EQUIPMENT MFG. CORP. HOUSTON 1, TEXAS
CHIKSAN EXPORT CO. BREA, CALIFORNIA NEWARK 2, N. J.

BALL-BEARING SWIVEL JOINTS FOR ALL PURPOSES

Hydraulic VICKERS POWER UNITS (STANDARD)

Simplify Hydraulic Design

Save Money, Space and Time

A self-contained power source for the hydraulic system on many types of machinery. Various pump combinations are available with necessary valving, filters, etc. for a wide variety of requirements. Vickers single, double and two-pressure pumps are used for 1000 psi continuous service; two-stage pumps for operating pressure to 2000 psi. Oil reservoir is base for Vickers Motor Pump or Vickers Pump with separate motor drive (shown). Ask for Bulletin 46-43.

VICKERS Incorporated • *Division of The Sperry Corporation*
1400 OAKMAN BLVD. • DETROIT 32, MICH.

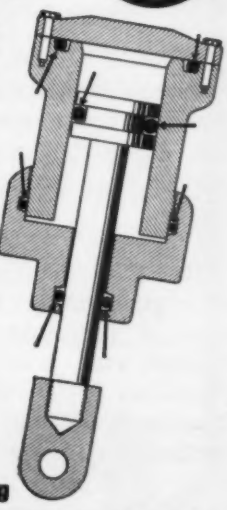
4319

Write for BULLETIN 46-43

O-RINGS by INJECTION MOLDING

Dependable Hydraulic Seals

Minnesota O-Rings function in air or gas systems as well as in hydraulic systems. Air cylinders . . . hydraulic valves . . . hoisting mechanisms . . . water pumps . . . bottling machines . . . refrigerators . . . motors . . . lubricators . . . are a few of their uses. Minnesota's exclusive injection process makes possible very close dimensions, uniformity in mass production and downright economy. We use special compounds of synthetic rubber to meet your exact requirements. Let us quote on your next hydraulic packing installation.



Manufacturers of all types of small rubber parts

Write for O-Ring Catalog

MINNESOTA RUBBER & GASKET CO.
3642 WOODDALE AVE., MINNEAPOLIS 16, MINN.

Circle 38 on Reader Service Card

Circle 34 on Reader Service Card

POST SCRIPTS OF INDUSTRY

NEWS · VIEWS · TRENDS

Gibson Engineering Company announce the addition of **Harold Hemming** to their group of sales engineers. Most recently Hemming has been associated with Westinghouse Electric Corporation, Sturtevant Division, Boston as manager of the Transportation Department. He brings with him twenty-five years of experience in drafting, engineering, design, laboratory research and sales.

Electrol Incorporated announces the appointment of **Vincent A. D'Aprile** as sales engineer to handle the company's line of hydraulic devices in the industrial field. D'Aprile was graduated from Renselaer Polytechnic Institute. He was formerly associated with Douglas Aircraft, serving in its wing design group.

Dr. John T. Rettaliata, dean of engineering at Illinois Institute of Technology, has been named vice president of the American Society of Mechanical Engineers. Rettaliata, a leading authority on turbine engines and jet propulsion, is the author of numerous technical articles. He joined the Illinois Tech staff in 1945 as professor of mechanical engineering and director of the department. He was named dean in 1948.

Joseph E. Bradbury has been promoted to manager of the Alloy Sales Section of the Valve & Fitting Department, Crane Co., Chicago. Bradbury has been with the company since 1928.

A newly-created position of Central Sales Manager, directing the sales of Buffalo, Detroit, Cleveland, Cincinnati and Pittsburgh offices, has been filled by **William A. Meiter**, according to an announcement by T. J. Kehane, general sales manager of Worthington Pump

SUMP TYPE (Cutaway)

LINE TYPE (Cutaway)

NOW OVER 166

Manufacturers Make

MARVEL SYNCLINAL FILTERS

Their O.E.M. Choice

For HYDRAULIC EQUIPMENT where oil MUST BE CLEAN

EFFICIENCY — Marvel Synclinal Filters give more filtering area than like size circular units. Preferred by maintenance men because larger filtering area extends periods of operation between cleanings.

SIMPLICITY — Marvel Synclinal Filters may be disassembled, cleaned and reassembled in minutes. A single handnut releases the line model housing without disturbing pipe-fittings.

ADAPTABILITY — Marvel Synclinal Filters operate at full efficiency in any position and can be installed at any angle convenient to your machine. Wire mesh sizes from 30 to 200 available. Individual capacities of from 5 to 50 gpm. and greater capacities are obtainable by multiple installations.

For efficient filtration of liquids in all HYDRAULIC or LOW PRESSURE circulating systems Marvel has your answer. Write for catalogs 104 and 202.

MARVEL ENGINEERING COMPANY

625 W. Jackson Blvd. Chicago 6, Ill.

and Machinery Corporation. **John W. Stovall** has been appointed manager of the Buffalo district sales office, succeeding Meiter.

C. N. Sugden has been appointed assistant director of engineering for gauges and instruments and **Robert Ingham**, succeeding Sugden, chief engineer for gauges at **Manning, Maxwell and Moore, Inc.**

The appointment of **S. R. Marshall** as director of purchases has just been announced by Hall Kirkham, president, **Hydraulic Equipment Company.** Prior to joining Hydreco, Marshall was associated with the Joy Manufacturing Company as purchasing agent, Cleveland Division, and with the Plymouth Division of Chrysler Corporation.

Chiksan Company has established sales headquarters for the Rocky Mountain area in Salt Lake City with **B. P. Ragsdale** in charge. With experience gained as member of Chiksan's Engineering Department, service representative and sales engineer in the Southern California territory, Ragsdale will handle sales and service on Chiksan, WECO, Anchor and Okadee products.

The Brady-Milwaukee Division of W. H. Brady Company, Chippewa Falls, Wisconsin, announce the appointment of **John P. Conde** as advertising and sales promotion manager, according to W. H. Brady, Jr., vice president. Conde will be located at Brady-Milwaukee Company's office at 204 W. Washington Street, Milwaukee.

William A. Steiger, manager of the patent department of the **Westinghouse Electric Corporation, East Pittsburgh,**

GREER ACCUMULATOR
Increases Speed of Weld Roller
Cuts its Cost $100

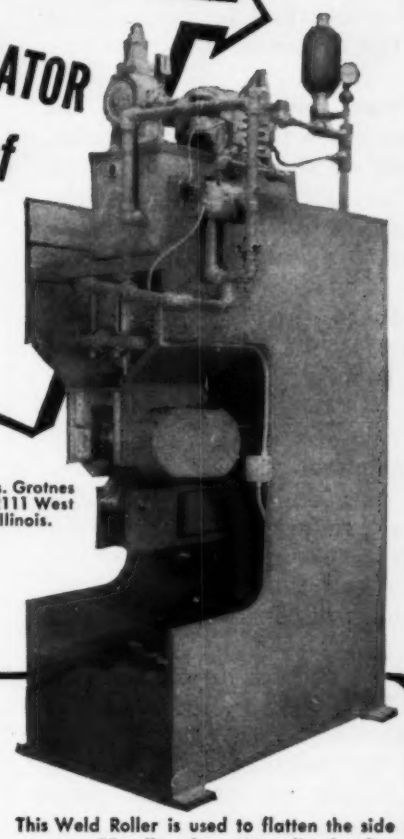


Photo courtesy of Chas. Grotnes Machine Works, Inc., 2111 West Lake Street, Chicago, Illinois.

United States Patents Under Oleer Licenses

This Weld Roller is used to flatten the side seam on 55-gallon drums immediately after they have been flash welded and stripped. The results are said to be so satisfactory that after the drum has been painted it is almost impossible to find where the drum has been welded.

Mr. Charles Grotnes, Vice President of the Chas. Grotnes Machine Works, Inc., of Chicago, reports that by incorporating one Greer Accumulator on the Weld Roller illustrated above, it was possible to replace a large pump and motor with a much smaller power unit. This resulted in a saving of one-hundred dollars in the original cost of the roller.

In addition, the Accumulator provided a bonus feature consisting of an increase of 50 to 75% in speed on the return stroke.

This is but one of many applications where Greer Accumulators are playing an important role in improving efficiency and reducing cost of equipment and machines using hydraulic power.

If you are seeking ways of upping production and reducing cost, it will pay you to have full information on Greer Accumulators. Write today for your copy of our Accumulator Bulletin 300.

Sales Representatives in all principal cities.

CAPACITY
From 2 cubic inches to 10 gals.
PRESSURE
Up to 3000 psi
TYPICAL USES
As a storage chamber and Shock absorber.
As an emergency source of fluid power.
For operating secondary systems.
As a dispenser of oils or greases.
As a thermal expansion compensator.
To reduce size of power unit in intermittent duty cycles.

YOUR SYMBOL OF SERVICE
GREER
HYDRAULICS INC.
454 EIGHTEENTH ST., BROOKLYN 15, N. Y.

Circle 41 on Reader Service Card

Pa., recently announced the appointment of E. H. Lamberger as assistant to the manager of the department.

Ward Leonard Electric Co. announces the recent appointment of W. C. Schofield as assistant sales manager Schofield, who will assist Frank E. Beede, company sales manager, has been associated with Ward Leonard since 1948, directing sales in the industrial control division.

The appointment of R. W. Hodgins & Son, Norfolk, Va., as distributors for the industrial products of The Parker Appliance Company, Cleveland, is announced by D. W. Holmes, Parker general sales manager.

Earl R. Mellen, president of the Weston Electrical Instrument Corporation, has announced the appointment of James J. Hagan as assistant plant manager.

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NEW! DIFFERENT!

TWO NEW VALVES FOR *Effortless* CONTROL OF AIR CYLINDERS!

TYPE NH (above)—A new hand-operated, four-way, directional air control valve. Sizes ⅛" and ¼". ⅜" lever motion.

TYPE NF (right)—A new foot-operated, four way, directional air control valve. Sizes ⅛" and ¼". With or without pedal guard.

HERE is the newest thing in air valves for operating single or double acting air cylinders! Built for *hand or foot* operation, these instant-acting valves provide fast, effortless control comparable to an electric valve—*at minimum cost.*

DISC TYPE; SELF-LAPPING—Metal-to-metal seat. Air tight. Packless.

PILOT CONTROLLED; PISTON OPERATED—Only light touch required; air does the work—shifts the main valve.

PRECISION ENGINEERED—Simple, compact, self-contained; rugged! Try one today. *Ask for bulletins.*

HANNIFIN *Corporation*

1155 KILBOURN AVE. • CHICAGO 24, ILLINOIS

Circle 42 on Reader Service Card

Continental *plastics* USES

HONAN-CRANE for HYDRAULIC OILS

Continental Plastics Corporation, Chicago, uses Honan-Crane oil purification equipment on each Reed-Prentice injection molding press.

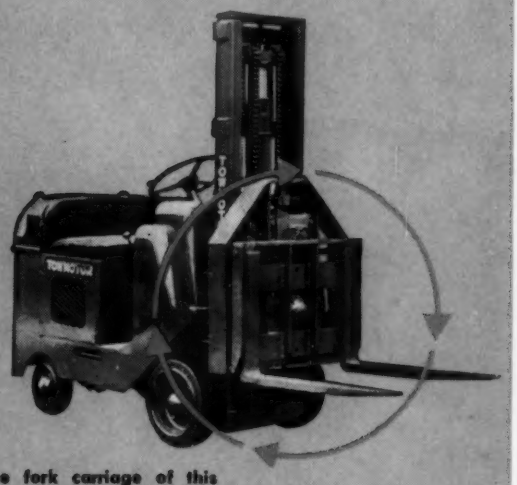
The continuous removal of all contamination (dirt, acids, varnish and sludge) protects the pumps, valve parts and other precision parts of hydraulic system. Excessive press maintenance and down time is eliminated.

For full information on low cost purification and maintenance of hydraulic oils, write to Honan-Crane Corporation, 102 Wabash Avenue, Lebanon, Ind., subsidiary of Houdaille-Hershey Corporation.

Circle 43 on Reader Service Card

Another Job for Pesco HYDRAULIC MUSCLES

DUMPING MULTI-TON LOADS IN 5 SECONDS



The fork carriage of this Towmotor model revolves 360 degrees in either direction.

The hydraulic motor which revolves the Towmotor carriage has a displacement of 1.0 cu. in. and develops 14.5 in.-lbs. torque per 100 p.s.i.

This Pesco hydraulic pump which develops the power for the above motor has a displacement of 1.28 cu. in. Capacity: 7.5 g.p.m. at 1500 r.p.m. at 1000 p.s.i.

● One of industry's most effective material handling time-savers is Towmotor's fork lift truck with the revolving carriage. With it a man can quickly and easily transfer heavy loads of solid, liquid, or granular material from one container to another.

The ingenious device that revolves the fork carriage in a 360-degree circle, in either direction, is actuated by a Pesco hydraulic motor so small it will fit snugly into the palm of your hand. Yet it is so powerful it will flip loads up to three tons completely over in five seconds!

Towmotor is one of the rapidly growing number of industrial equipment manufacturers who are turning to Pesco for answers to their hydraulic problems. They have found that the skills and precision craftsmanship that Pesco has developed to meet the exacting requirements of the military and civilian aircraft manufacturers insure the high quality and trouble-free operation they demand in their own products.

Perhaps the sales power of hydraulic power can help you, too. If you have a problem in squeezing, gripping, lifting, holding, or turning heavy loads with precise accuracy and finger-tip control, why not let Pesco engineers suggest a solution.

A preliminary discussion will involve no obligation.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

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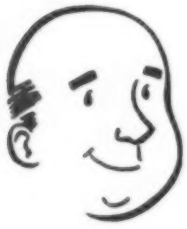

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